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Agricultural Gazette of New South Wales.

Wheat-growing in New South Wales.

H. A. SMITH, Government Statistician

THE western limit of profitable wheat-growing in New South Wales was first determined in 1904 by Mr. (now Sir) T. A. Coghlan, then Government Statistician, on the basis of records of the experience of farmers during the preceding decennium. In view of the great development which had occurred by 1912, the matter was again investigated in that year by my predecessor in office, Mr. J. B. Trivett. The present inquiry was undertaken by me at the expiration of ten years from the last investigation, and furnishes results which may prove of service in connection with the land policy now being pursued.

The accompanying map has lines drawn across it representing—

(*a*) the eastern limit of wheat-growing in 1922;
(*b*) the western limit of wheat-growing in 1922;
(*c*) the western limit of wheat-growing in 1912;
(*d*) the western limit of wheat-growing in 1904;
(*e*) the western limit of 10-inch rainfall in the growing season—average from April to October inclusive.

The first four lines mentioned were determined with regard to the size of areas harvested for grain and the average yield in each locality over periods of about ten years preceding the date of determination. They embrace, therefore, localities in which wheat crops are raised on a commercial scale with a profitable yield of grain, but some allowance has been made for abnormal factors, such as unusual seasons and variations in farming skill. No account is taken of the production of wheaten hay, and this memorandum refers throughout only to wheat-growing for grain.

The eastern limit is now delineated for the first time, and the line marking the western limit of lands receiving 10 inches of rain in the growing period (April to October inclusive) is as determined by the Commonwealth Meteorologist on averages for various periods ending 1922, but in no case for less than twenty years.

The total area of land between the eastern and western lines, as existing in 1922, is approximately 53,000,000 acres. The area added to the wheat belt between 1904 and 1912 was 13,500,000 acres, and between 1912 and 1922, 6,000,000 acres. The proportion of these areas actually suited to wheat-growing is not known accurately, but it is probably not more than one-half.

In 1904 very little of what are now among the principal wheat lands of the State were under crop at that comparatively early stage in the development of wheat-growing, before the benefit of improved plant types and transport facilities had been experienced. By 1912 wheat had been grown successfully in territory over 30 miles further west in the northern part of the Central Plains, and from Fifield south to the Victorian border successful wheat-farmers were distributed over a strip of land extending up to 80 miles west of the limit delineated in 1904. A considerable part of the progress forecasted in 1912 was realised by 1922, viz., a new strip of varying width was added to the wheat belt along the whole boundary from Coonamble to Rankin's Springs, while the easterly curve near Barellan was transformed into a north-westerly bend, jutting forth as far as Hillston on the Lachlan River, and in the far south-west of the Riverina wheat was profitably grown in an area extending along the Murray to its confluence with the Murrumbidgee River.

The greatest development in any direction, in point of magnitude of area, has occurred in the Riverina, where 3,600,000 acres have been added to the wheat belt—2,200,000 acres in the central districts, 900,000 acres in the far south-west, and 500,000 acres in the extreme north. Extensive development also occurred in a strip of country traversing the whole of the Central Plains Division, particularly from Coonamble to Dandaloo, and on all sides of Condobolin. The total area added to the wheat belt on the Central Plain was 2,400,000 acres.

On the North-central Plain no expansion of area occurred.

The Western Wheat Line in 1922.

The western wheat line along its entire length passes through the edge of the great western plains, where the natural features of the country are uniform. Its trend is decided principally by rainfall and the nature of the soils.

Starting from the Queensland border, north of Yetman, the line follows the same course as in 1912, trending in a south-westerly direction across the plains and curving southward around Pilliga. It is doubtful whether the line should here be placed so far west or extended so far north. The inclusion of Moree was originally justified by the results obtained at the experiment farm, which existed there until 1910, and the line was extended to the Queensland border on slender evidence. Although the rainfall in these districts is on the average 11½ inches during the growing period, the heavy black soils are unsuitable for wheat-growing. Cultivation in the neighbourhood of Moree and north-east to Yetman and Bonshaw has at no time been extensive, and the yields obtained by farmers have seldom been satisfactory. With good reason the line might be modified to begin near Ashford, to cross westward to Pallamallawa, and thence south-westward to Wee Waa. This would restrict the wheat belt to districts where the

average rainfall from April to October exceeds 12 inches. Around Pallamallawa wheat has been extensively grown for twenty years. The average yields of the past ten seasons were as follows :—15·5, 12·1, 11·2, 6·3, 4·3, 4·2, 3·3, 1·6, 17·8, and 15·2 bushels per acre, and the area cultivated in 1921–22 was 5,000 acres. At Wee Waa the average yields in the same period have been 9·8, 12·8, 9·0, 10·8, 8·5, 7·4, 4·0, nil, 15·1, and 13·7 bushels per acre.

Formerly Coonamble was excluded, and its inclusion in the wheat districts s still open to some doubt, having been decided upon mainly in view of the results of the last two seasons, when the rainfall received in the growing period was far above the average of 10·44 inches. The maximum area cultivated for grain in the district was 3,500 acres in 1916–17, and the average yields between 1912–13 and 1921–22 were as follows :—1·6, 8·5, 12·1, 6·9, 6·9, 3·5, 0·2, 1·6, 20·0, and 12·5 bushels per acre. The area cultivated in the last two seasons was about 1,250 acres.

Continuing south, the line sweeps to the west of Gulargambone and Collie, where excellent yields are harvested regularly from extensive areas. It borders the Warren district, and embraces small areas around Nevertire, where the average rainfall is less than 9½ inches in the growing period. Around Warren the area harvested for grain is small and varies considerably under seasonal influences. Although excellent yields have been obtained in favourable seasons, the smallness of the area cultivated does not yet justify the inclusion of the Warren district, especially as operations are intermittent.

From Nevertire the new boundary fringes the 1912 line to Fifield, near which it turns westward and crosses the line of 10-inch rainfall in the growing season, thence traversing districts of low rainfall all the way to the southern border of the State.

North of Condobolin the line makes a wide westerly sweep, and encircles a considerable extent of land, which receives on the average in the growing season from 9·79 inches at Condobolin to 9·03 inches at Cargelligo. At Condobolin extensive crops have been raised regularly for twenty years, and although the average yields have generally been low in the past ten years—5·3, 7·8, nil, 4·8, 10·9, 11·6, 3·4, 2·6, 13·8, and 7·5 bushels—the area cultivated in 1921–22 exceeded 18,000 acres.

In the neighbourhood of Cargelligo and further south, better results have been obtained, and considerable development has occurred in the past twenty years. The average yields since 1912–13 were as follows :—10·2, 7·9, nil, 6·1, 15·0, 14·3, 3·3, 0·8, 17·7, and 10·8 bushels per acre, and the area cultivated in 1921–22 was 18,800 acres.

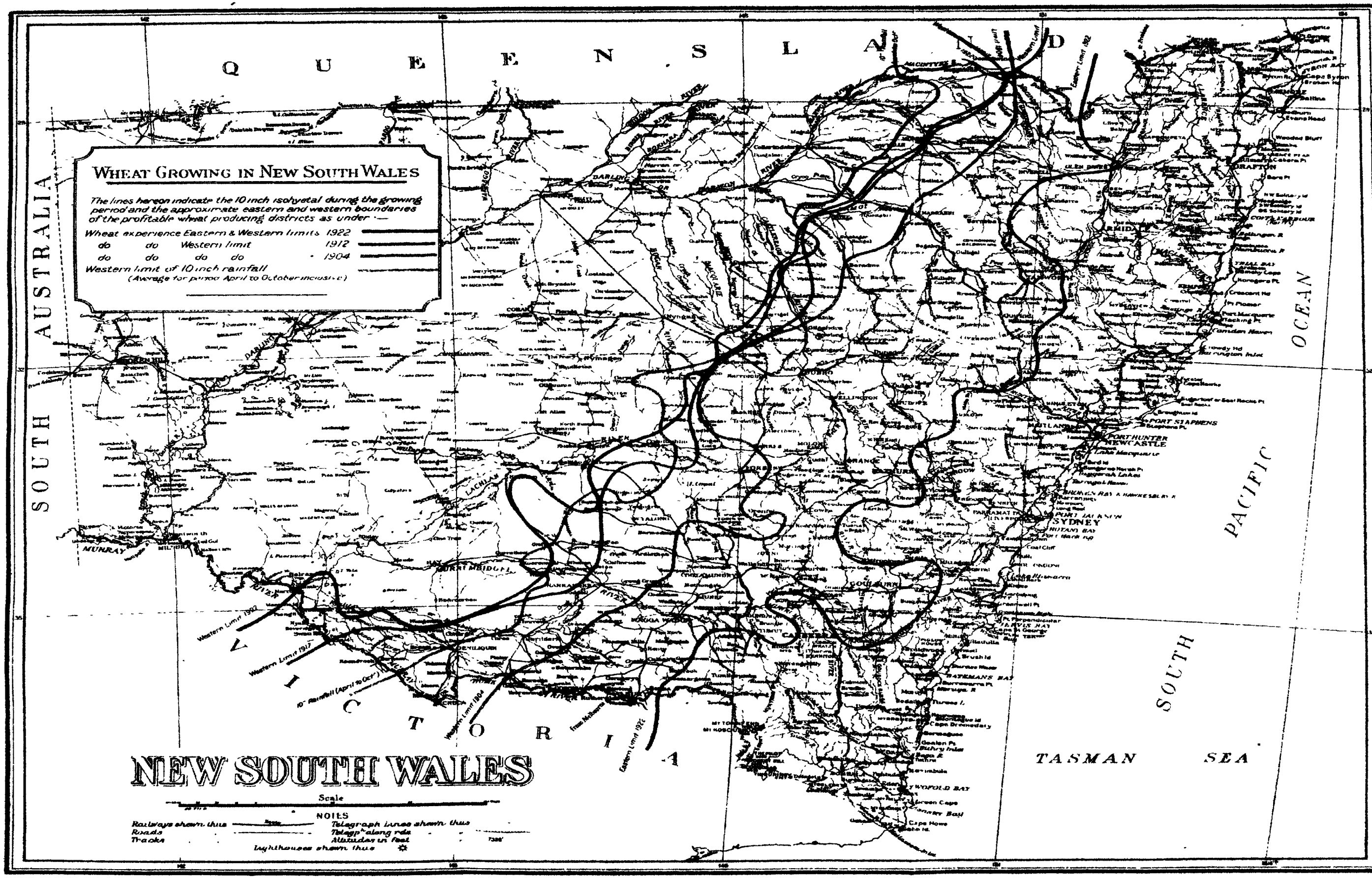
The line touches the 1912 line near Rankin's Springs. to the east of which wheat has been produced for twenty years with a bare average of 10 inches of rain in the growing season. Still further west of this line lie extensive wheat lands spreading north-west from Rankin's Spiings, which recent investigations show await the provision of transport facilities to ensure

development. From Rankin's Springs the new wheat line curves sharply to the west, and embraces a new strip of territory reaching to Hillston on the Lachlan River. Here large areas ranging from a total of 4,000 acres to 11,000 acres have been cultivated regularly for more than thirty years, although prior to 1916–17 the yield only once exceeded an average of 10 bushels per acre. But since that year a remarkable improvement has taken place, and, although the average rainfall is little more than 9 inches in the growing period, farmers to the south-east of Hillston have gathered crops in the past six years which have shown a greater yield per acre than those of the whole State or even the Riverina, except in 1919–20. The average yields per acre from these crops between 1916–17 and 1921–22 were 13·5, 15·6, 9·7, 3·1, 19·3, and 1 ·7 bushels. This fertile district has now been penetrated by a railway which may be expected to stimulate further progress in wheat-growing. Although some wheat is grown near Gunbar, and new operations are contemplated in the neighbourhood, actual results do not yet justify its inclusion in the wheat belt.

From Hillston the wheat line turns south-eastward through the Murrumbidgee Irrigation Areas and crosses the river near Darlington Point 60 miles east of Hay, where the average rainfall in the wheat-growing season is 9·40 inches. In the region excluded are large areas of heavy black soils not yet found adaptable to wheat-growing.

After this wide detour the new line dips to the south and follows the limit established in 1912 until it reaches the Edwards River. Here the former wheat line ended suddenly, but the new line turns in a north-westerly direction parallel to the Murray, embraces Moulamein and extends to Balranald on the Murrumbidgee, terminating finally at the confluence of the two rivers.

Thus, in the extreme south-western corner of the Riverina a belt of land with an average width of about 20 miles, extending some 50 miles along the Murray River has been added to the wheat belt. Wheat has been extensively grown in these districts for more than thirty years, despite the surprisingly small yields which prevailed prior to 1915–16. Considerable expansion has occurred around Moulamein since 1906, but the area cropped declined from 22,260 acres in 1916–17 to 12,240 acres in 1921–22, owing to unfavourable conditions. Still, compared with earlier years, the yields have improved, and in the last ten seasons were 7·8, 7·5, nil, 9·9, 14·8, 8·4, 8·1, 3·4, 14·1, and 11·1 bushels per acre. To the south of Balranald the area cultivated reached its maximum of 3,724 acres in 1906, but 2,150 acres were cropped in 1921–22. The yields of the past ten years have been 3·8, 7·8, nil, 10·5, 13·1, 11·5, 7·0, 3·5, 16·3, and 8·0 bushels per acre. Although these yields are below the average for the State, it is thought that the improvement shown as compared with previous years, and the extent of land cropped, warrant the inclusion of these districts, especially when allowance is made for adverse seasons. Around Barham, more than 50 miles west of Moama



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on the Murray River, on areas ranging up to a total of 5,400 acres in 1917–18, the following excellent yields have been obtained in the past ten years—14·4, 16·1, ·9, 18·8, 15·3, 14·7, 11·1, 7·1, 19·4, and 11·6 bushels per acre.

Up to the present transport facilities have been confined to river boats, but with the imminent extension of Victorian railway lines across the Murray from Echuca to Balranald and from Kerang to Stony Crossing, it is probable that considerable development will take place.

A fact of great significance is that at Balranald, which at present is the most westerly point of the wheat district, the average rainfall between April and October is only 7·89 inches. This is less than at Euston (8·10 inches) and scarcely greater than at Wentworth (7·76 inches), which are respectively 47 and 102 miles further west on the Murray River. For some distance beyond Balranald the isohyetals run in the same direction as the river, but only a narrow strip of land enjoys an average rainfall approaching 8 inches in the growing season.

Although a large area has been added to the wheat belt on the west in the past ten years, a more important development has occurred in the improvement in the average yields in districts of low rainfall, particularly to the south and south-westward of Balranald, where, with an average rainfall of about 8 inches in the growing period, crops are raised regularly with yields which, though low, are apparently profitable or operations would cease. The development here is similar to that south of the River Murray in the north-west corner of Victoria, where wheat has been produced for years with an average rainfall of about 8½ inches in the growing period.

The Eastern Wheat Line in 1922.

On the east, the wheat line is determined partly by the contour of the country and partly by the rainfall. Very little wheat is grown at an altitude of more than 2,000 feet, or in districts where the country is rugged, and comparatively little where the average rainfall in the growing season exceeds 15 inches. The eastern wheat line passes through districts where the average annual rainfall ranges from 25 to 33 inches, and, except where the physical features of the country interfere, the line tends to follow approximately the 30-inch isohyetal. Except in a few districts bordering this line, such as Inverell, Tamworth, and Cowra, the area cultivated for wheat has diminished since 1900, while in some more easterly districts the cultivation of wheat, which was formerly extensive, has ceased altogether, and it is apparent that the eastern limit of wheat-growing has moved westward in many places. This change may be attributed partly to the competition of other forms of agriculture, such as the growing of oats, maize, and hay crops; but agricultural operations are not very extensive in the localities where wheat-growing is declining.

Beginning on the Queensland border north of Ashford, the present eastern limit of wheat-growing proceeds first south and then east to Glen Innes, and circles back nearly to Inverell and thence to Barraba. In these districts

the yields obtained are generally excellent, and in the neighbourhood of Inverell and Delungra areas ranging up to a total of 46,000 acres in 1920–21 produced in the past ten years averages of 18·5, 13·8, 15·6, 10·6, 8·7, 7·9, 1·9, 3·7, 19·2, and 11·5 bushels per acre, with an average annual rainfall of 30½ inches, of which 15 inches fall in the growing period.

The inclusion of Glen Innes is open to question, for, although satisfactory yields have been obtained here for more than thirty years, the area has declined steadily since 1906, and in the last two seasons was only 209 and 104 acres respectively. Until 1916–17 yields of grain were obtained from larger areas as far east as Tenterfield, and small areas are still cropped around Armidale.

From Barraba the line trends south-eastward and encloses the extensive wheat lands of which Tamworth is centre. Here large areas ranging up to a total of 93,000 acres in extent are regularly cultivated, with an average annual rainfall of 27·39 inches (14·20 in the growing season), the yields of the past ten years being 15·0, 14·5, 8·0, 19·3, 7·9, 8·7, 4·7, 4·3, 23·8, and 9·9 bushels per acre. Further to the east and south between Moonbi and Nundle, with an appreciably greater rainfall (exceeding 18 inches in the growing season), small areas are sown, but the yields are not so good, and the area cropped has declined in the past seven years.

From Nundle the line curves east to Murrurundi (near which the areas cultivated for wheat are small), and then proceeds due south along the Great Northern Railway to Muswellbrook, thence south-east to Denman, west towards Wollar, and south again to Rylstone on the railway line to Mudgee.

While wheat-growing exists to a small extent in the upper valley of the Hunter as far east as Singleton, it was never practised very extensively, and in the neighbourhood of Muswellbrook there has been a steady decline, the total area now cultivated ranging from 150 to 500 acres annually and producing very variable yields. Similar remarks apply to the districts of Merriwa and Cassilis further east. The wheat line might here be varied to pass from the west of Murrurundi to Cassilis to Rylstone; but at Rylstone also wheat-growing is declining.

From Rylstone the eastern wheat line proceeds south-westward across the western part of the Central Tableland to Sofala, then southward, encircling the Bathurst district, where in the lower altitudes along the upper reaches of the Macquarie River considerable areas are cropped for grain, though the area is now only one-third of what it was in 1900. The average rainfall at Bathurst is 23·93 inches per year (12·85 inches in the growing season), and the yields of the past ten seasons were as follows :—11·8, 15·7, 15·5, 14·8, 10·0, 10·7, 8·2, 3·7, 17·8, and 10·5 bushels per acre.

South of Bathurst the line makes a wide westerly detour towards Cowra, and, excluding a large expanse of rugged land between Sofala and Crookwell, turns southward in a wide sweep to the east around Goulburn, skirts the

Shoalhaven River, and passing through Queanbeyan, turns north-westward through the northern part of the Federal Capital Territory and debouches from the tableland districts south of Yass.

The yields to the east of Blayney are apparently satisfactory, although the area cultivated is not large, having decreased steadily since 1899. Toward Cowra, however, where the altitude and average precipitation are less, very great development has occurred, and here, with an average annual rainfall of 23·75 inches (of which 14·05 fall in the growing season) and an altitude of about 1,000 feet, up to 50,000 acres are cropped for grain over a wide district. The yields in the past ten years have been as follows :—20·5, 10·0, 6·8, 22·6, 7·0, 10·3, 10·0, 4·0, 19·2, and 15·0 bushels.

East of a line joining Crookwell and Queanbeyan the areas cropped for grain have decreased rapidly since 1900, and are now comparatively small in extent, but west of Crookwell and Gunning the areas are larger, and considerable development has taken place, especially in the neighbourhood of Yass.

From Yass the wheat line proceeds westward for a short distance, then turns to the south, and then again westward past Tumut, finally dipping southward through Holbrook to Bowna, near Albury, on the Victorian border.

Around Tumut, on the foothills of the highest mountains of the State, the average annual rainfall is 31·23 inches, and in the period April to October 20·93 inches. Here the areas sown are small and have declined since 1900. The yields in the past ten years have been comparatively low, viz., 18·3, 11·6, 4·7, 19·0, 9·0, 5·9, 6·1, 16·1, 11·8, and 9·5 bushels per acre. At Holbrook, where the average rainfall reaches 18·62 inches in the growing period, land has been cropped for wheat in the past twenty-five years, the yields in the last ten seasons being 17·4, 10·5, 3·8, 14·2, 8·6, 6·5, 8·6, 10·9, 19·0, and 11·4. The area cropped in 1915–16 was 15,500 acres, but by 1921–22 it had decreased to 5,500.

At Albury wheat has been produced regularly for the past twenty-five years, with an average rainfall of 19·19 inches in the growing season, but the area cropped has declined in the past ten years from 4,000 to 1,100 acres. Some of the best wheat districts of the State lie to the north-westward.

Factors Affecting Wheat-growing.

In New South Wales the main factors determining the extent to which wheat may be grown profitably are—

(1) Class of soil; (2) rainfall and evaporation; (3) science; (4) transport; (5) price and yield.

The first two, being natural factors, are more or less fixed in their incidence, but the class of soil and the amount of rainfall necessary to successful wheat culture may be, and have been, greatly modified by the scientific advances in soil culture and plant-breeding in the past thirty years.

Of course, the price of land and competition of other profitable pursuits, such as dairying and the growing of oats, maize, and hay, exercise a restrictive influence on wheat-growing in the easterly districts where the rainfall is plentiful enough. But the market for hay is limited and along the western wheat line—as indeed over the greater part of the wheat belt—the average rainfall is so low that wheat-growing and sheep-raising are the only extensive activities, and these are becoming complementary rather than competitive.

Soil.—Although it is certain that very large areas of land in New South Wales are arable, the absence of a soil survey leaves the extent of land which may be actually cultivated for wheat in some doubt. The most recent estimate (that of Mr. F. B. Guthrie) is that the area suitable for grain and hay covers in all 26,000,000 acres, or nearly one-half of the area in the wheat belt in 1922. There were at the end of 1922 roughly 34,000,000 acres of land within 12 miles of railways in the principal wheat districts, but a large proportion of this area is rough or rock-strewn, or consists of heavy black soils unsuitable for cultivation. The Chief Inspector of Agriculture estimated that the lands contained therein included 18,000,000 arable acres suitable for wheat-growing. My own computation (based upon the opinions of farmers as to the area of alienated land in their holdings suitable for cultivation), is that, of 24,940,000 acres of alienated lands within about 12 miles of railways in the principal wheat districts, 12,058,000 acres were considered arable in 1922. At the same date there existed only about 7,500,000 acres of land in the State on which wheat had been sown in recent years, 3,250,000 acres being new land brought into cultivation between 1911 and 1922.

Rainfall.—Whatever the qualities of the soil, the cultivation of wheat at present requires more rainfall than is enjoyed over the greater part of the western plains of New South Wales. Almost everywhere a high degree of variableness in precipitation and a rapid evaporation have to be contended with. In the severest seasons, such as those of 1902–3 and 1919–20, almost universal failures have been experienced, while in other years, *e.g.*, 1907–8 and 1918–19, yields have been universally low.

Formerly it was found that an average of at least 10 inches of rain in the growing season (April to October) was essential to "safe" wheat-growing, and practically the whole of the western half of the State (consisting almost entirely of immense plains largely adaptable to cultivation) receives less than this amount, while the average rate of evaporation from exposed water reaches as much as 8 feet per annum, increasing as the rainfall diminishes towards the west. Hence scientific methods must be adopted to stabilise the yields and to develop dry areas. The western limits of wheat-growing still conform roughly to the limit of 10-inch rainfall in the growing season, but in 1922 approximately one-tenth of the wheat belt was situated beyond this limit.

Science.—By persistent experiments and educational propaganda through the Department of Agriculture, such advances have been made in the science of wheat culture that in some districts farmers now produce wheat successfully on lands where the average rainfall in the growing season is as low as 9 inches (*e.g.*, Hillston), and even 8 inches (*e.g.*, Balranald). Furthermore, by the choice of improved varieties of wheat and the adoption of fallowing and dry farming methods, the Department has obtained profitable yields on farmers' experiment plots in seasons when the rainfall has been so low as to produce failures elsewhere.

The extent to which fallowing and fertilising were practised in the principal wheat areas of New South Wales in 1921–22 varied between districts. In the northern parts 10 per cent. of the area sown was fallowed, in the central districts 30 per cent., and in the southern 50 per cent. Practically none of the northern lands were fertilised, while perhaps 25 per cent. of the area sown in central districts, and 80 per cent. in southern districts were so treated.

Superphosphate is the only fertiliser used extensively. The average weight used in 1921–22 was 50 lb. per acre.

It is clear that there exists considerable scope for improvement in cultural methods in these directions, while advances in plant-breeding are still being made.

Transport.—It is generally held that it does not pay the farmer to cart his wheat more than about 12 miles, that being, in most cases, the greatest return journey which can be accomplished in one day. However, in a number of districts (notably near Hillston, where for a number of years wheat was grown more than 30 miles from the nearest railway) farmers have been transporting wheat considerably greater distances. Co-operative effort to provide better transport facilities by road is still untried.

In the south, along the Murray River, some use is made of river boats, but elsewhere practically all the wheat is carried long distances by railways, which thus assume very great importance in relation to the wheat-growing industry. During the past ten years fifteen new lines have been opened in the wheat areas, comprising 646 miles of railway.

Price and Yield.—These are the ultimate factors which do most to determine the progress of wheat-growing, and, as both vary considerably from year to year under seasonal and market influences, the value of the crop per acre becomes the measure of profit or loss. The cost of production varies very greatly under varying conditions and according to the skill of individual farmers, but the Select Committee of the Legislative Council estimated in 1921 that the proper cultivation and harvesting of wheat would cost £3 5s. per acre, or 4s. 8d. per bushel, for a 14-bushel crop. Up to the present the actual receipts by farmers from the various pools 1915–16 to 1921–22 are as follows:—4s. 3d., 3s. 1d., 4s. 1d., 4s. 7d., 7s. 8d., 7s. 5d., and 4s. 8d. per bushel respectively.

However, on many holdings where wheat is grown sheep are depastured, and as a consequence other elements besides price and yield of grain enter into consideration of the profits accruing from the cultivation of wheat. Doubtless this circumstance explains why wheat-growing has continued in a number of districts where for long periods very low yields have been obtained. It is an important fact, also, that in the aggregate, probably one-half of the wheat belt is suitable for grazing only, so that it is certain that sheep will occupy a permanent place among wheat farms in New South Wales, varying in importance according to the soil and climatic conditions of respective districts.

Although the average yield of wheat in New South Wales in the past ten years (11·6 bushels per acre) shows improvement upon former years (10·0 for the period 1892–1901), it is still considerably below that of the United States and Canada, though higher than in other large producing countries.

The spread of agricultural education, the increased appreciation of the value of scientific methods, the payment for superior grades of wheat through the adoption of grading and bulk handling, and the introduction of rural credit schemes and encouragement to co-operative effort, may be expected to produce greater progress in wheat-growing in the next decade.

Treatment of Cotton Seed with Superphosphate Paste.

THE treatment of cotton seed so as to get rid of the "fuzz" which prevents it from running freely through the plate in the maize drill may be accomplished in several ways. Among the methods suggested has been treating the seeds in a fairly thick paste made from superphosphate; it has been found to be efficient as far as the planting is concerned, but it has also been found to have an adverse effect upon germination, a fact which was confirmed by tests carried out recently at this farm.

Lots of treated and untreated seeds were planted on black alluvial and on red volcanic soils on 24th October last, in shallow drills, and covered to a depth of 1½ to 2 inches. By 16th November 76 per cent. of the untreated seeds had germinated on the black alluvial plot, but there was a germination of only 48 per cent. of the seed treated with the superphosphate paste, while on the volcanic soil the germination of the untreated seed was 73 per cent. as compared with 19 per cent. in the case of the treated lot.

Superphosphate paste, therefore, has undoubtedly a detrimental effect on germination. It sets very hard and seems also to harden the seed case, as several of the seeds, although rooted, failed to split the covering, which prevented the young plant from making an appearance. Practically all the seeds that germinated appeared above ground with the seed case still enclosing the young leaves, and several of these plants died owing to the fact that they were unable to shed the case. This was also noticed with a few of the untreated seeds, but the young plants had no difficulty in shedding the seed case. There was also a marked difference in the appearance of the young plants of both plots, the treated ones in most cases having a withered appearance and a yellowish tinge on the young leaves.—W. R. WATKINS, Experimentalist, Grafton Experiment Farm.

Copper Carbonate and the Removal of Bunt Balls from Seed Wheat.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist.

In the method of dipping seed wheat in bluestone solution for the prevention of bunt, many of the bunt-balls float to the surface and can be skimmed off. The question of removing bunt-balls when wheat is to be treated with dry copper carbonate has been raised.

The prime act of husbandry is the preparation of the seed-bed. Having prepared a good seed-bed, the next act of importance is to put good seed in the bed. It follows that in all cases seed wheat should be graded. Should bunt balls be present the greater number of them will be removed by that process. However, the fact that seed wheat has been graded does not altogether exclude the possibility of bunt-balls being present in the graded sample, and it is here that the value of the dry copper carbonate treatment should come in The bunt spores are not killed when the dry copper carbonate is dusted upon each grain—the killing process begins when the wheat is sown and comes in contact with soil moisture. That being so, the fact that a few bunt-balls may burst and infect the grain a little more is immaterial. If the copper carbonate killed the spores when applied and subsequently became inoperative the presence of bunt-balls would mean reinfection, but one of the advantages of copper carbonate over dipping appears to be that reinfection is impossible, since the living bunt spores upon the grain are killed, not at the time of treatment, but at the time when the wheat actually begins to germinate.

According to A. Moretti* the treatment of seed wheat with dry copper carbonate, or dry caffaro powder, results in an increased yield, even when no bunt is present. Various treatments were tried, and at harvest showed the highest figures for copper carbonate treatment. Caffaro powder was next, then copper sulphate, water, and the control in the order named. These results are explained by the fungicidal action of the copper compounds in preventing injury from the ordinary soil fungi or those carried on the grain, the beneficial effect being counteracted in the case of the copper sulphate treatment by the injury to the embryo of the seed.

There is no doubt that the ordinary soil fungi have, in some instances, a very detrimental effect upon the germination of seed wheat. In New South Wales we have in some seasons had wheat which failed to germinate satisfactorily, and upon digging up the grains they were found to have been more or less destroyed by the action of fungi. Moreover, in testing germination

* Le Staz. Sperim Agrarie Ital. LV., 7-9, pp 264-277, 1922.

upon a damp substratum, some samples of wheat were found to be so infected on the surface with the spores of ordinary fungi that upon germination their growth was seriously impaired.

The Minnesota Agricultural Experiment Station has been trying-out the dust treatment for preventing smut in grain. The reports of these trials are found in Special Bulletin No. 70. The following is a summary of the results obtained :—

1. Dusting seed wheat with copper carbonate prevents stinking smut.
2. Dusting with copper carbonate is preferable to formaldehyde treatment for the following reasons :—(1) It saves time and labour. (2) The seed can be treated any time before planting, and it is not necessary to use great care in disinfecting seed containers. (3) The seed does not become wet; freezing, therefore, will not injure it, nor is there any danger of heating or sprouting if it is necessary to keep it for some time after treating. The drill does not have to be set for swollen grain. (4) Copper carbonate dust does not injure the seed as formaldehyde often does. (5) Copper carbonate dust has a tendency to stimulate seed germination and thus increases yields.
3. In the experiments made during 1921 and 1922, smuts of oats also were controlled by copper carbonate, and the average yields of treated plots were greater than those of the untreated plots. It is probable that the dust also will prevent rye smut and covered smut of barley, but more experiments must be made to determine this point.
4. Two ounces of dust will treat one bushel of seed grain.
5. Copper carbonate dust can be purchased from drug stores for about twenty cents. per pound. The cost of treating a bushel of seed is about 2½ cents.
6. The dust must be mixed thoroughly with the seed. Every kernel should be covered. This can be done best by the use of a simple mixer made like a barrel, churn, or a cement mixer.
7. Smuts of oats and covered smut of wheat can be practically controlled by copper carbonate dust.
8. The dust also may control the covered smut of barley, flag smut of rye, kernel smut of sorghum and millet smuts. Experiments are being made to determine this.
9. The loose or naked smuts of wheat and barley, timothy smut, maize smut, and the head smuts of sorghum and timothy are not prevented by chemical dusts. Neither are they prevented by the ordinary formaldehyde treatment.

Control of Wheat Diseases by the Farmer.

J. T PRIDHAM, Plant Breeder.

WHILE the value of scientific research in regard to wheat diseases and the efforts of plant breeders in evolving a resistant variety, must, of course, be recognised, it is well to bear in mind the important part the farmer can play in the matter. The diseases of greatest interest in this connection are foot-rot, take-all, bunt, flag-smut, and rust, and farmers' efforts may be considered under two heads—(1) fallowing and (2) the seed.

Fallowing.—Fallowing is not only carried out for the sake of conserving moisture; it destroys weeds and helps to germinate and get rid of disease spores in the surface soil when the necessary cultivation is maintained. Grasses carry fungi which may attack wheat, and if the soil is kept clean, many of the spores may be made to germinate and die for want of a host plant. The soil conditions best calculated to promote a healthy growth of wheat happen also to be favourable to the germination of disease germs. The ideal is a firm, moist, fine seed-bed (though not too fine just on the surface), the result of cultivating the fallow whenever rain has thoroughly compacted the surface. More harm than good is done by working the soil when somewhat dry: the tendency is then for soil spores to become more widely distributed and drier, in which state they will be preserved for future infection of the wheat. It is true that cultivation tends to consume the humus of the soil, but if in the oxidising process we also get rid of a large proportion of the spores of the various fungi associated with the old stubble and crop remains, it is worth while. Crop rotation should be practised as far as possible for fallowing to have its best effect, so that crops such as rape, lucerne and oats should be grown at intervals to starve the fungi.

Sheep are a valuable adjunct to fallowing. They serve to compact the soil, above all keep down weeds, and save the expense of working the surface too frequently. The value of good fallowing is seen in a season like the present, when flag smut is prevalent in the wheat districts. The writer was through a crop recently where plenty of this disease was showing, but the healthy plants had grown all the more vigorously on the moisture conserved in the soil as the diseased plants died out, so that the resulting crop was good in spite of the presence of the disease.

There is nothing new about the foregoing, but a repetition of the facts may serve as a reminder that farmers cannot afford to forget the value of a well prepared fallow if the soil is to be managed to the best advantage.

Seed.—We sometimes hear the remark that such and such a variety is very subject to smut or bunt, and has been discarded on that account, yet a neighbouring farmer grows it as his main variety and will have no other, and

is not troubled by bunt. It has been found that some varieties are rather more susceptible than others, but our experience is that with careful pickling one can grow any variety of wheat free from bunt. Often the trouble is caused by a farmer starting with seed which has bunt balls in it, and his drill becomes infected, or the pickling may not have been carefully enough done. If one sows clean seed—not of doubtful origin—there is no danger from this disease, providing the pickling is done with reasonable care. Similarly some wheats appear to be more liable to foot-rot than others, but we have found the disease in all varieties in cultivation—none are immune—so that there is no need to reject a good yielding wheat because it may be disease-liable.

Horse feed taken on to a farm by travelling chaff-cutters, teamsters, or farm hands using a private horse is often a source of infection. If disease spores and weed seeds are to be kept off the place, the grain and chaff used should as far as possible be grown on the farm. Farm machinery and bags borrowed from a neighbour may carry diseases. It is usually best to sow a soil which grows rank leafy crops later in the season; diseases are likely to be worse in such soil, and early sowing would give them a chance to get a footing.

In short, by proper soil management and the use of only sound, plump, healthy seed one can go far towards reducing disease, even if it cannot be eliminated.

Hickory King Seed Maize Contest.

In connection with the Hickory King seed maize contest, promoted by the Department of Agriculture, one package of seed has come to hand that is unaccompanied by a letter from the competitor. Probably the letter has gone astray in the post, but the Department would be glad of any information that would help to the elucidation of the matter, and particularly would be glad to hear from any competitor who omitted to write when posting his sample of seed. In the meantime the whole of the samples have been sown, in the hope that it will yet be discovered from whom the extra one comes.

The Future of Lucerne-growing.

The profitable results of feeding and fattening sheep on well-grown irrigated lucerne has been fully demonstrated wherever it has been tried. It is a part of the established agriculture in the Range stock regions of the United States, where in the last ten years the grazing and irrigated areas have come into much closer relationship than formerly. Careful study of the situation here leads to the conviction that a similar change will take place in this State, and that the result will be a large extension in the lucerne-growing areas, and the creation of a profitable form of agriculture to supplement fruit-growing. This matter is one of first importance to New South Wales, because of the large extension of irrigation soon to be made on the Murray, and because lucerne-growing ought to have a conspicuous place in the agriculture of the Murrumbidgee scheme.—Dr. Elwood Mead, in his Report on Fodder Conservation.

A Short History of Rinderpest.

R. C. BELL, M.R.C.V.S., Government Veterinary Surgeon.*

BECAUSE of its infectious and destructive character rinderpest has received the attention of experts from earliest times. At first it was considered identical with human smallpox, then typhus, and dysentery. It was also supposed that the virus appeared spontaneously under the influence of deteriorated food, and long and exhaustive drives; also during unusual meteorological conditions. These views, however, are no longer maintained.

Since the beginning of last century the idea of spontaneous origin has been more and more abandoned, and in 1902 it was definitely proved by its filterability through porcelain filters that it was due to an organism which is invisible through the strongest microscope (ultravisible). The disease is due to the presence of the virus in all tissue fluids and secretions (saliva, nasal discharge, urine, fæces, bile, tears, perspiration, and vaginal discharge).

Its original home was Asia, where it has probably been raging since the early ages, and where it still exists through the whole continent as a terrible scourge, thousands of cattle being lost yearly through it and other diseases. Owing to the impossibility of impressing on native races the need for cleanly sanitation amongst stock, all attempts to stamp out the disease have proved abortive.

From Asia it was carried into Europe by way of the Black Sea, the means of conveyance being the cattle that accompanied the migration of armies and people westward, and extensive outbreaks usually occurred after the great wars in the early centuries. The wars of Charlemagne in the ninth century, and the incursion of Mongols into Europe in the thirteenth century, are particularly noted for widespreading the disease. From 1700 to 1720 it was particularly virulent in Europe. In 1711 to 1714 over 1,500,000 head of cattle died, and later Holland was visited and lost every head. During the great Napoleonic wars the disease was rampant in Germany and France, and it was as a result of the great losses that the latter country first established its veterinary schools.

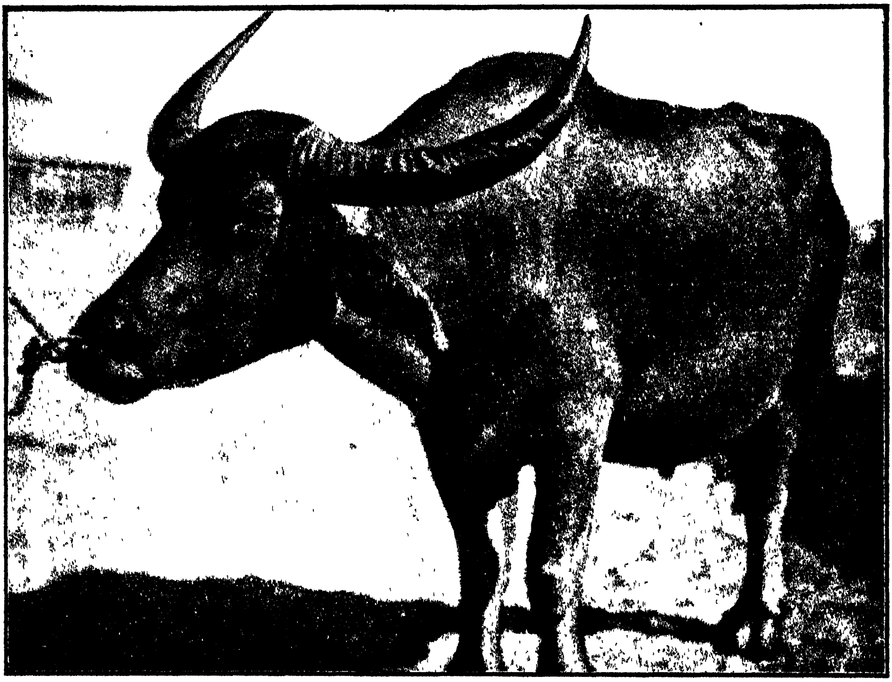
Exclusion of the Disease from Europe.

In the middle of the nineteenth century, the European governments combined together and succeeded in pressing the disease back to the far East, but owing to a fresh outbreak during the Franco-Prussian war, it was not till 1881 that it was finally forced back to Russia and Turkey, and more recently it has apparently disappeared from European Russia.

* This article has been written in view of the recent outbreak in Western Australia. It is not intended in any way to create alarm, but to forewarn the stockowners of this State, and at the same time to indicate the chief symptoms of the disease.

Great Britain was clear of the disease for 120 years from the middle of the eighteenth century, but in 1865 a boatload of cattle from Finland brought in the disease which extended to eighty-five counties, and in a year and a half 500,000 cattle died. The last outbreak, in 1877, was introduced from Hamburg, and 1,200 cattle died.

In 1866 the disease spread from England to Holland and within a year had affected 156,000 cattle, of which 78,000 died, 37,000 were slaughtered, and the balance recovered.



Carabao, or Water Buffalo, of the Philippine Islands, infected with Rinderpest.
Note the swollen, cushion-like appearance of the eyelids.
[*From Twentieth Annual Report of Bureau of Agriculture, Philippine Islands.*

Towards the latter part of the eighteenth century Italy lost 3,000,000 cattle in three years, and later in 1862 to 1868 very heavy losses were incurred. The last outbreak in Italy occurred in 1878 in the province of Naples.

Austria, Galicia, Bukovina, and Hungary all lost heavily during these periods. Austria has been clear since 1880, and Hungary since 1881. Russia has suffered severely, and as late as 1907 six districts east of the Caucasian Mountains were affected, whilst in 1908 three infected transports introduced the disease from Siberia to Petrograd, where it was successfully combated in the abattoirs under veterinary inspection.

Rinderpest occurs continuously in Turkey, especially in the vicinity of Constantinople and the Marmora Sea district.

In 1902 the disease was introduced into Japan from Korea, but with energetic measures it was eradicated in two years.

In 1841 rinderpest was introduced into Egypt by the importation of animals from Austria, and up to 1864 it was not known to exist in any other part of Africa. In 1890 it was introduced into Abyssinia by the invading Italian army's cattle. In five years it had spread southward along the Nile and had reached the South African states, and also German West Africa. It was in Somaliland and Massiland in 1890, Nyassaland in 1892, and on the shores of Lake Nyassa in 1893. Owing to lack of communication, it is not known to what extent it existed in Central Africa during this period. By

Rinderpest in Bechuanaland. Cattle shot and dead from the disease.

In one small valley 5,000 cattle were said to be lying similar to the above.

[*From "Diseases of Animals in South Africa,"* C. R. *Edmonds*

March, 1896, it had reached Buluwayo, through, it is believed, some missionary cattle from the Mafungatusi district. It devastated the country and decimated the wild big game as well as the cattle, 97 per cent. of the latter being lost. Bechuanaland lost 1,000,000, and Matabeleland probably 1,500,000 head.

Various attempts to check its progress south were made, but without success. In 1897 the Transvaal lost 980,000, and Cape Colony in 1897 and 1898 lost 1,300,000 head. The Cape Colony Government then invited Professors Koch, Bordet, Theiler, Pitchford, and others to investigate, with the result that they produced a method of combat which proved successful in Africa and which has proved of inestimable value to other countries.

Rhodesia, being practically denuded of cattle, was the first to be cleared, followed by Basutoland and Orange River Colony in 1902. Swaziland, Portuguese East Africa, and the Transvaal were clear in 1903, and Zululand and German West Africa later. In 1918 a scare was caused by the leader of the German army crossing from German East Africa into Northern Rhodesia to surrender, but as he surrendered all his cattle as well, they were slaughtered and the danger averted.

The disease has never appeared in America, Australia, or New Zealand. At present it is endemic in Asia, India, Asia Minor, Turkey, and Abyssinia. It is probably also still endemic amongst the nomadic tribes of Africa, in which form it causes little loss, but should it come into contact with some "unsalted" susceptible animals it might spread with alarming rapidity before it was checked. It is for this reason that the South African authorities have a fully equipped and efficient staff of veterinary surgeons all trained and prepared to engage in the stamping out of the disease in any part of the country wherever it may break out. Profiting by their lessons of the later years of the last and the early years of the present century, they are fully prepared and armed with authority to use the most drastic methods on the first appearance of the disease.

At the end of June, 1920, an outbreak of the disease occurred in Belgium. A cargo of zebus from British India, consigned to Rio de Janeiro, was disembarked in quarantine at Antwerp for reloading, and many of them died there. Apparently no autopsies were made and rinderpest was not suspected. During June and July three boatloads of cattle for food were disembarked and despatched to various abattoirs, but some remained in quarantine (which had not been disinfected) for one or two days. These latter were also sent to various abattoirs for immediate slaughter, but at Ghent abattoirs out of ninety-four bullocks seventeen were slaughtered as sick, and three died. At the same time a consignment of German cattle for reparation was unloaded for distribution, infection occurred, and the infected animals were sent to various country districts. By the 15th August fifty-eight communes with 150 farms were affected and 1,068 cattle had died or been destroyed. Drastic measures were adopted and the outbreak declined from that date, until by October only four centres remained, and these have since been successfully dealt with.

Veterinary Control can Check the Spread.

Owing to the stringent measures adopted by the French authorities, the disease was unable to cross the frontier into France, and the lesson to be learnt from this outbreak is that preparedness is the main weapon of defence in guarding our country from the many contagious diseases which up to the present have not touched it. Had the Belgian authorities suspected rinderpest earlier—and from the origin of the cargo this should have been done—the outbreak would not have reached the proportions it did, but would

have been confined to the abattoirs and have been speedily stamped out. Even so, the fact remains that it should be easily combated in the early outbreaks in countries which possess an adequate veterinary sanitary organisation.

The outbreak in France in 1865 was stamped out by intelligent intervention, and the 1920 outbreak was prevented from crossing the border by their veterinary equipment. The heavy losses in England during the outbreak of 1865 were due to the absence of any organised veterinary service.

Infection and Course of the Disease.

The virus is conveyed from one centre to another chiefly by means of infected animals, or of uncooked fresh meat; but it can also be conveyed by infected hides, wool, food, stable utensils, clothes, railway trucks, &c. Living intermediaries, such as man, non-susceptible animals, &c., play their part, but the Belgian authorities state that precise observations have shown that flies do not transmit the virus. The possibility of infection through the air has not been established. Infection occurs through the digestive tract.

Cattle, especially young animals, are exceedingly susceptible, but buffalos are much less susceptible. Camels are susceptible to a mild form of the disease, as also are sheep, goats, and ruminants living wild, and these animals bear an important part in the distribution of the disease. Swine may also contract the disease. Horses, mules, donkeys, carnivora, and the human being are not susceptible.

One attack of the disease usually abolishes the susceptibility and even confers a certain amount of immunity. Cattle in South Africa which had been inoculated or had recovered from an attack of the disease were known as "salted" animals. Calves from cows ill during pregnancy are very resistant against infection, but as a rule cows abort during the course of the disease.

The period of incubation varies from three to nine days. The first symptom of the disease, which usually precedes other manifestations by one or two days, is a very high fever temperature which may reach 107 deg. Fah.; the temperature is unevenly distributed over the body; the base of the ear and horns are hot to the touch, the muzzle dry, the coat staring, repeated chills are frequently observed, and the pulse reaches fifty or sixty beats per minute, and in severe attacks may rise to ninety or one hundred. The animals manifest great debility and a marked depression and dullness; they stand apart from other animals with head and ears drooped, back arched, and the four limbs brought together under the body; if possible, the head is rested on some object of support. In exceptional cases excitement precedes this depression, but only lasts a few hours; the appetite is depressed, but the thirst increased. Rumination is delayed or sometimes

ceases. The fæces, which at first are dry and dark coloured, are passed at long intervals. The urine is diminished and of a darker colour. The milk secretion is considerably diminished from the outset.

As the disease progresses characteristic inflammatory changes of the mucous membranes appear; the conjunctivæ are bright red, the eyelids swollen and cushion-like, and tears run profusely down the face; later, this secretion becomes mucous and soon purulent. The mucous membrane of the nose, mouth, rectum, and vagina become spotted, then uniformly reddened and hæmorrhagic. These spots begin as red patches and streaks, and are converted into a grayish-white slough, which, when shed, leaves a small erosion or ulcer. Diarrhœa sets in, and the rectum may become inverted and paralysed and the bowels move spontaneously. Coughing is a common symptom.

In severe cases death usually ensues four to seven days after the appearance of the manifestations, and is preceded by great emaciation and debility, fœtid purulent discharges from the nose and mouth, and from the relaxed rectum and vagina.

The affection of the mucous membranes appears on the second day, and the clinical symptoms on the third or fourth day. In other cases death may occur on the second or third day or may extend to fourteen or sixteen days.

In mild cases the symptoms do not develop to such a degree, and usually commence to recede on the fourth or fifth day. Convalescence lasts from two to three weeks.

On post-mortem examination the chief changes will be found in the digestive organs. The lining membrane of the mouth, pharynx, larynx, nasal cavity, trachea, vagina, and rectum is covered with mucous, is reddened in spots and shows superficial yellowish grey, cheesy patches, which, when removed, expose ulcerated depressions. These patches are also found in the fourth stomach and small intestines, but rarely in the cæcum. The third stomach, or bible, is impacted with dry hard food. The lungs may be injected, œdematous or pneumonic. The heart muscle is pale and flabby, and hæmorrhages are frequently found in its internal membrane. The liver may be pale or injected with blood and at times hæmorrhagic. The gall bladder is distended, and contains thin, greenish-yellow, offensive bile. The kidneys are inflamed, hæmorrhages appear in the tissue or lining. The lymphatic glands may be swollen or even hæmorrhagic.

On account of the danger of spreading the infection, neither medical treatment nor inoculation is permitted in European countries (except Russia). All affected and exposed animals must be slaughtered.

In South Africa treatment of the disease by inoculation was carried out—in fact, it was in South Africa that this method of treatment was perfected.

Dairy Farm Buildings.

Their General Outlay and Construction.

L. T. MACINNES, Dairy Expert, and A. BROOKS, Works Superintendent.

SOONER or later the problem of constructing new premises in connection with the operations of a dairy farm confronts every owner. If the land is being utilised for the first time for dairying, the first thing to be thought out is how to plan, erect, and generally place the various buildings required to carry on dairy farming successfully. On old, established dairy farms the buildings have to be replaced, perhaps not all in the one year, but in course of time a new lot of premises have to be provided. These should be put up on a plan that has been carefully thought out to suit the configuration and aspect of the land.

It is with a view to assisting and guiding dairy farmers in doing this to the best advantage that this article has been compiled. No set plan or plans will suit all cases, but it is still possible to indicate the essential items and to allow modifications to be introduced.

The General Plan.

In considering the lines upon which a dairy farm should be laid out, there are a few general principles that should be kept in view in all cases. These may be stated as follows:—

1. Easy access to all parts of the farm.
2. Efficient and economical handling of stock and performance of all farm operations.
3. Good drainage.
4. Aspect—protection from weather and openness to sunlight.
5. Economy of working.
6. Safeguarding the contents of separator and cream store-room from contamination from dust and bad smells.

In the plan presented as Fig. 1 accompanying this article, the buildings are supposed to be situated in some central elevated spot. The paddocks abut mainly on the milking and feeding yards, and the cows can be brought in from any paddock, and after milking released into a fresh one, if necessary, without having to travel any considerable distance. Not only does this save the animals from unnecessary walking, but it economises time, which is a very important consideration under modern conditions.

The Outlay of Buildings, Drains, and Yards.

The plan has been prepared so that the work shall be carried out in regular forward order from the time the cows are brought in to be milked. After the herd has been received into the main yard, sick cows and those

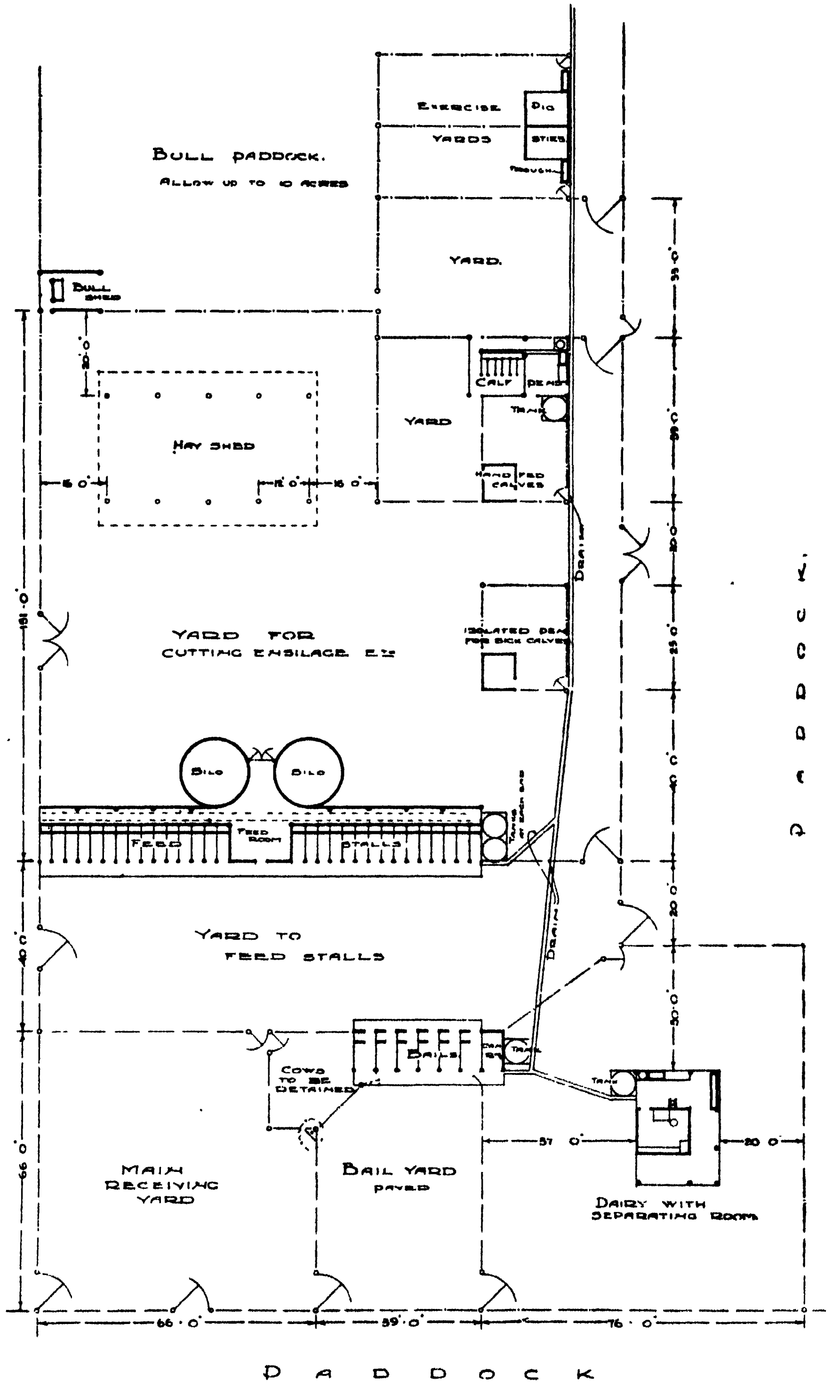


Fig. 1.—Proposed Grouping of Dairy Farm Buildings.

needing special milking or treatment, can be drafted into a small yard connected with a special bail shut off from the rest of the bails by a swing gate. Where there is contagious mammitis, every care should be taken to milk affected cows apart from their mates, and they should be the last to be handled, so as to minimise the chances of the disease being spread by the milkers' hands to sound cows.

The inner yard (called the "bail yard" in the plan) for the use of the main herd should be paved, heavily metalled, or concreted, and it is preferable that it be covered by a good water-tight roof. These conveniences keep the yard clean, and the milkers and cows dry and comfortable. This roof should be elevated and well pitched, so as to allow plenty of room overhead, free ventilation, and ample light. A flat roof is not so suitable, and a pitched gable style is much more satisfactory.

The cows, after passing through the bails, go forward to the feeding stalls, which are placed in front of the silos and on each side of the feed store and mixing-room. At each end tanks can be placed for catching roof water. The yard behind the silos should be sufficiently large to permit of the teams which draw in the hay or green fodder being handled with ease, and also for the placing of the steam engine and chaff-cutter with elevator or blower. Behind this ensilage yard provision is made for hay sheds, leaving a 16-feet lane on each side down to the bull paddock. A shelter shed for the bull is placed on the side nearest the hay shed to be handy for feeding. On the right hand side behind the feeding stalls a pen and yard is provided for sick calves. This is situated well back from the milking yards, bails, and feeding stalls, and a lane 15 feet wide divides it from the paddocks.

Back some 30 feet from this isolated pen are placed the yards and pens to be used by healthy calves, the youngsters being nearest to the dairy and bails as they require more attention. Next to the general calf pens and farthest away from the dairy are the pig runs and pens. Directly to the right of the bails, some 37 feet away and enclosed in its own yard, is the dairy with milk and cream store-room. The whole makes a compact block of some 181 feet wide at the cow yard and dairy end, and 132 feet at the pig pens, by approximately 272 feet from the front of the cow yards to the pig pens and 237 feet to the commencement of the bull paddock. The size of the pig run and of the bull paddock or paddocks, and the distance of their back fence from the cow bails and dairy would all depend on the number of animals to be kept, the configuration of the land and the manner of running the lines of fencing.

The dairy is shown to be situated 37 feet from the nearest part of the cow yards and bails; 62 feet to the nearest part of the feeding stalls; 95 feet to the nearest calf pen; 140 feet to the main calf pens, and 214 feet to the nearest part of the pig pens.

The buildings and yards should be placed on high or rising ground—in the latter case it should not be too steep. This is necessary for drainage purposes, and to enable the ground to dry quickly after rain. If placed on

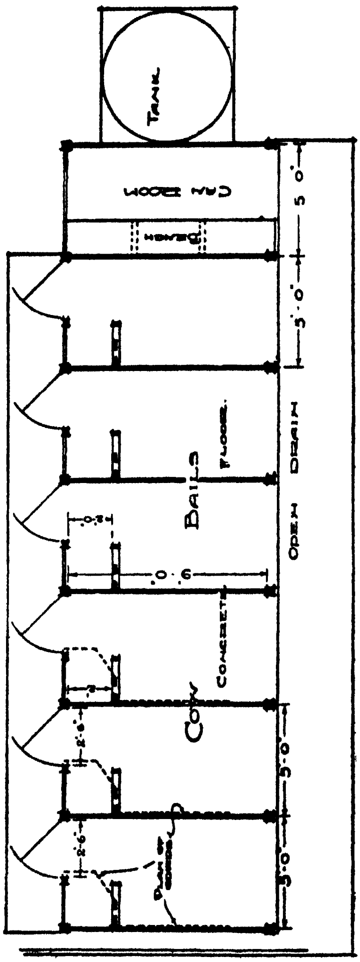


Fig. 2.—Plan of Cow Bails for Hand Milking.

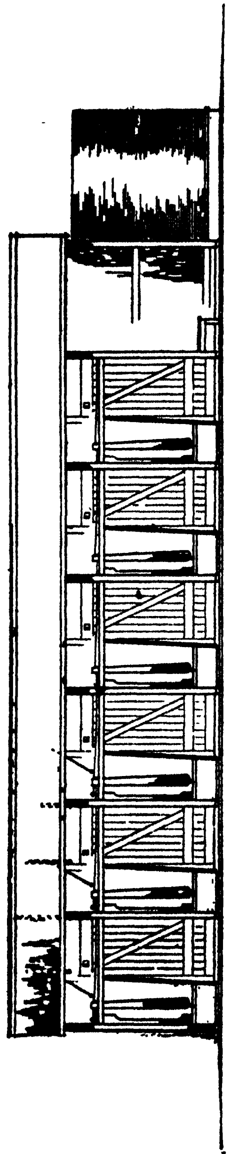


Fig. 3.—Side Elevation.

level country the cattle soon become very dirty, making cleanliness in milking almost impracticable and the task of getting them into the bails irksome and unpleasant. Calves and pigs, if they are to be healthy, must be kept in well-drained, dry areas. The dairy where the milk or cream is stored must be placed where the washings can be drained away, and where the prevailing winds will not carry the dust from the cow yards or any smells that may arise from the pig pens. On most of the east coast of Australia the prevailing winds in the summer come from the north-east, on the Northern Tableland of New South Wales they are from east or west, and on the Central and Southern Tablelands and South-western Slopes, they are mainly from the west and south.

On the accompanying plan the dairy is supposed to be to the west of the bails (the north-west corner), thus escaping the effects of the north-easters, southerlies, or westerlies. East or south-east winds would certainly be felt, but these are infrequent. On the North Coast this is the best position for the dairy. On the tablelands the dairy should, other things permitting, be placed in the south-west corner of the block.

One main drain is shown commencing from the bails, with a branch from the dairy, and running due south past the calf and pig pens. This, however, may not suit in every or most cases. The placing of the drains is a matter to be well thought out on each farm according to its own special conditions and the contour of the land.

If, through unavoidable circumstances, a grade cannot be obtained, concrete drains can be made from the dairy and the bails, in order that washings and other liquids can be run clear of the premises and yards. These drains should not be less than 45 feet in length, and they might with advantage empty into shallow concrete sumps (2 feet deep), in which vessels can be placed to catch the drainage. These should be emptied immediately after each milking or after separating is finished, and the dairy and bails washed down.

The Milking Yards, Approaches, and Exits.

The yards as well as the approaches and exits should be heavily stoned, in order that a foundation may be obtained which will not break up in wet weather and become a bog, or in dry weather create clouds of dust that are both a nuisance and a menace. Large stones should be laid down first, and on top of these finer metals or coarse river bed gravel and pebbles. The bigger stones are necessary for a foundation, because after heavy rains small material is trampled into the soil and sinks out of sight, permitting the surface to become a quagmire. Where cattle pass through gateways there is always a crush and a rush, and it is, therefore, important that such approaches and exits should be dealt with just as carefully as the yards themselves. The surfaces of all yards and approaches require to be graded to facilitate draining and should be kept even, in order to prevent the formation of holes that will contain water. On flat country it may be

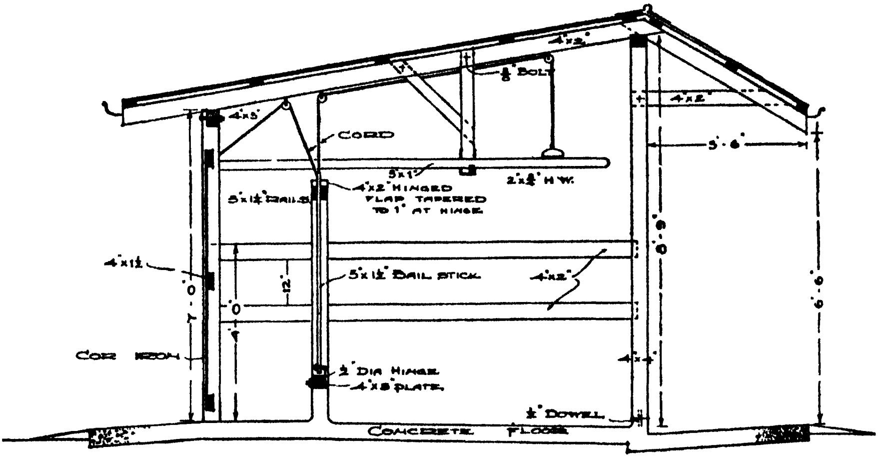


Fig. 4. Cross Section.

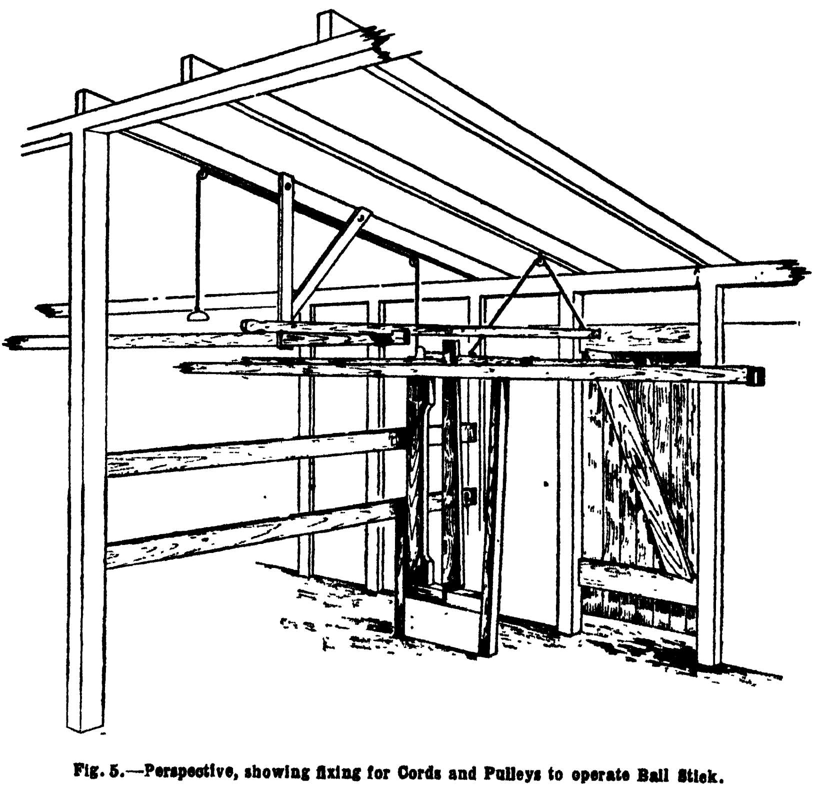


Fig. 5.—Perspective, showing fixing for Cords and Pulleys to operate Bail Stick.

necessary to provide underground drains, that is, trenches dug to a depth of 2 feet and, say, 1 foot wide, and graded to permit the soakage to get away. Filled with stones and rubble they serve this purpose admirably.

Yards and approaches require constant care, as they are continually being worn by the cattle passing over them. If allowed to fall into disrepair they soon become in a very bad condition, necessitating a large expenditure of time and labour to bring them back to a satisfactory state again.

Fences for Milking Yards.

These should be strongly made of the post and rail type. A short wing might run out for two or three panels (25 feet) from the entrance gate at right-angles to serve as a lead or guide for the stock. The outer yard

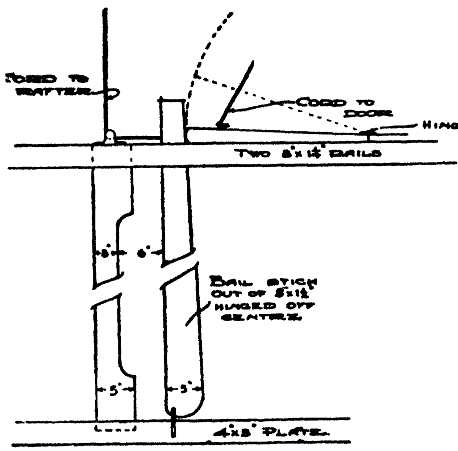


Fig. 6. - Detail of Bails.

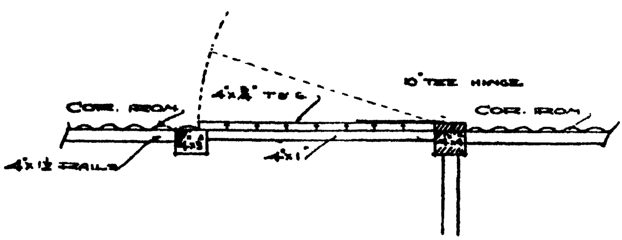


Fig. 7.—Detail Plan of Doors to Bails.

should be large enough to hold the whole milking herd comfortably. It is often made in a circular form, or, failing that, with rounded corners, in order to prevent cows from being jammed and horned, as frequently happens when they are cornered. There are always bad-tempered females in every herd, and these make a practice of horning their quieter, more docile mates when given the opportunity. Temperament plays a large part in the milk yield. The good milkers are generally docile and quiet, and if horned and frightened they give less and poorer quality milk; so it pays the farmer

to look after them well. The inner yard should be covered from the weather and be large enough to contain, without crushing, sufficient cows to fill the bails at least twice over. By having this yard covered it is possible for the milkers to bail up their cows in bad weather without getting wet, and (very important) it allows the cows to stand a sufficient time under cover for the moisture to drain off their skins before they are put into the bails. Where this is not done the drips often fall into the milk bucket, and as they contain large numbers of injurious micro-organisms the quality of the milk and cream suffers.

The Cow Bails.

The plan which is shown in Fig. 2 makes provision for six bails for hand-milking with a bench on which the milk cans can stand to be filled before being placed in the can room at the end of the bails nearest the dairy. Next to this a tank can be erected to hold the rain water that falls on the roof of the bails. A plentiful supply of water is an essential at all bails for cleansing purposes, not only that the bail floors and drains may be washed down, but that the cows' udders, teats, and flanks may be cleaned with a damp cloth and that the milkers themselves may have ample water for frequent washing of their hands. As the whole of the buildings are grouped together it should be possible to conduct the whole of the roof catchment to an underground tank, from which it could be raised to an elevated tank that would supply the dairy and bails. Such water would be very suitable for cooling cream, &c.

The bail farthest from the can-room can be shut off from the main yard and be used for sick cows solely, and the adjoining one (No. 2 from the left on the plan) could be fitted for breaking in heifers.

The situation of the bails should be such that they get the full benefit of the sunshine, and yet the milkers should not be exposed to the weather, but be sheltered as far as possible from the hot rays of the afternoon summer sun and from cold winds and rains. The best situation is to face the bails to the north or north-by-east, as shown in Fig. 1. The roof should be weather-proof, and the floors impervious. The back and sides should be closed in to protect both dairymen and cows. Plenty of light and ventilation are essentials of the whole business.

The roof should be furnished with guttering and down piping that will lead off all rain water to a tank or to the main drain, instead of allowing it to fall into the yard or at the exits where the cows come from the bails. The floors of the milking sheds and bails should be laid down with concrete or other approved impervious material brought to a smooth finish, the whole forming one continuous floor, graded to the front to connect with a shallow, wide drain formed like a segment of a circle or a wide shallow step. If of the latter type all angles should be rounded off. This drain should be placed behind and clear of the cow's hind legs as she stands in the bail.

The bails shown in Fig. 5 are constructed on the principle that the cow after being milked passes out at the head of the bails through a swing door

worked with cord and hand lever, which facilitates its opening and shutting. The verandah on the yard side of the milking shed protects those working at the bails from the weather—both rain and summer sun. The awning projection at the rear of the shed is a protection from driving

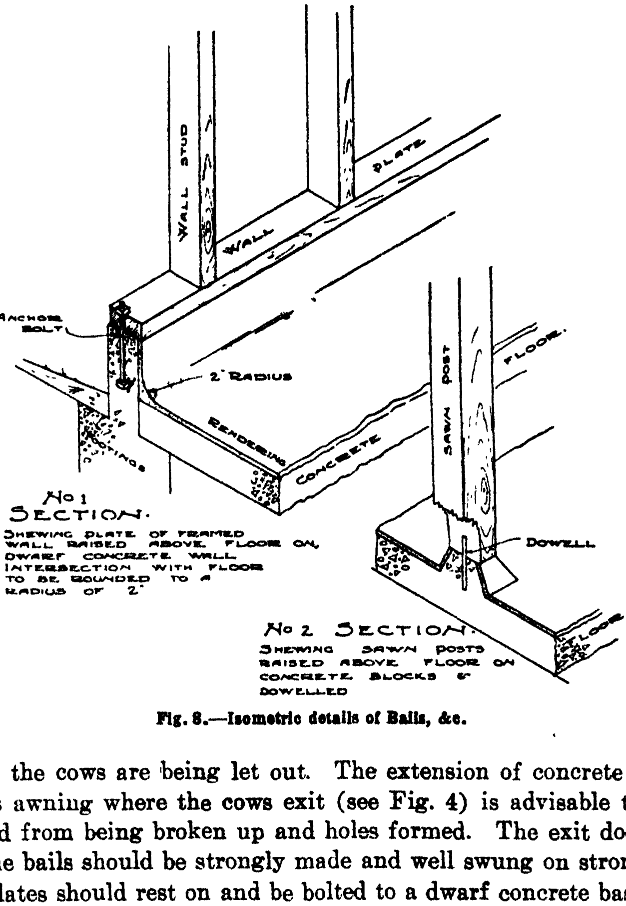


Fig. 8.—Isometric details of Bails, &c.

rain when the cows are being let out. The extension of concrete as shown under this awning where the cows exit (see Fig. 4) is advisable to prevent the ground from being broken up and holes formed. The exit doors at the head of the bails should be strongly made and well swung on strong hinges. All wall plates should rest on and be bolted to a dwarf concrete base at least 12 inches high—rounded off at the intersection with the concrete floor (see Fig. 8).

Neglected to Pickle the Seed.

In a recent crop-growing competition the judge remarked on a crop that from a distance appeared to be one of the finest inspected. but which on close examination showed 50 per cent. of bunt. The farmer had grown the seed the previous year without pickling, with excellent results. The competition crop was sown on fallow, and again unpickled. The ten-bag crop will give five bags of bunt. The Department's advice is—always pickle, even though the seed-bed be dry and the seed apparently bunt-free.

THE EFFECTS OF FLOOD ON WHEAT CROPS.

WHEN the Lachlan River overflowed its banks early in October, submerging promising wheat crops, little hopes were entertained for a recovery. Record crops from such areas were not anticipated, but actually individual farmers benefited to the extent of £1,000. When it came to the judging, a few crops were pictures of evenness and will yield between ten and thirteen bags per acre. But it was generally noticeable that the heads, though well filled, were short, no doubt due to the fact that the heads were formed in the straw prior to the flooding, and were actually dry area production. The flood ensured that all stems and ears already formed would produce the maximum. It was found that a flood of two to four days, so long as the water was moving, produced the maximum benefit: but where the water lay for a longer period and remained stagnant, injury occurred—in some places completely killing the plants.—H. BARTLETT, Senior Agricultural Instructor, reporting on the Forbes Crop-growing Competition, 1923.

A PASTORALIST'S INQUIRY.

"I AM forwarding to you two samples of wool, both taken from the same lamb. You will notice that one sample has a green stain; this wool was taken from just behind the shoulders. As we have several lambs with the stain, I would like to know if you can tell me the cause of it. The lambs are about 6 months old and were dropped in a very dry time."

The stain is hard to account for, said the Sheep and Wool Expert in reply; the more so in view of the statement that the lambs were dropped in a very dry time. During wet seasons the stain is quite a common occurrence just behind the shoulder of the Merino, but it is almost unknown during a dry season. With careful treatment it scours out, however, leaving the wool quite white. Experts with world-wide reputations among live-stock men are unable to give a reason for the occurrence of the stain.

INTERESTING WHEAT-GROWING RECORDS.

THE value of superphosphate in relation to wheat-growing in certain portions of this State was reflected in a note recently forwarded by Mr. H. Bartlett, Senior Agricultural Instructor

Mr. D. N. Nixon, a competitor in the Corowa crop competition, related to Mr. Bartlett that until three years ago he had never used superphosphate, and up to that time had never harvested an average of more than four to five bags to the acre. With the addition of superphosphate at the rate of only 45 lb. per acre, he secured from 400 acres in 1921 an average of ten bags to the acre, and in 1922, from a crop of 300 acres, an average of nine bags per acre This year, on the section judged, the yield is estimated at eleven bags per acre, and from the whole 400 acres under Federation a repetition of the ten-bag average can reasonably be anticipated.

Trials of increased quantities of superphosphate for next season's operations are contemplated by this grower, and the experiments should yield instructive results. It is only by actual tests and observation of the results in the quantity of wheat bagged that the value of a fertiliser—or of any other practice—can be determined

Crop-growing Competitions, 1923.*

SOME OF THE JUDGES' REPORTS.

The Lockhart Competition.

B. M. ARTHUR, Agricultural Instructor.

THE following are the awards in the competition conducted by the Lockhart Pastoral and Agricultural Society :—

Best farm of growing crops.—1, A Healy; 2, M. J. Doherty.

Section A, Best 60 acres of wheat for grain on fallow.—1, A. Healy; 2, P. Rees.

Section B, Best 30 acres wheat grown for hay.—1, P. Rees; 2, J. Jones.

Section C, Best 30 acres oats.—1, Gollasch Bros. 2, S. R. Jarvis and Son.

The competitors in the best farm of growing crops were limited to three, as several farmers who submitted 60 acres of wheat on fallow decided to withdraw at the last moment from the main competition, some section or other of their crops, in their opinion, not coming up to expectations, and thereby prejudicing the more high yielding and cleaner areas of their total sowings. This was unfortunate, as it robbed the section for which the largest prizes were offered of much of its local interest and of the healthy rivalry it creates.

The winning crop of 230 acres was good throughout, though 85 acres ot Marshall's No. 3, sown on fallow, stood out on its own. The estimated average yield was 25 bushels. All but 65 acres was on fallowed land, and thus, besides having the best average yield, it scored points for cleanliness and cultivation over other competitors whose crops were on new or stubble land. The fallow was June ploughed, and received four harrowings and five springtooth cultivations between August and seeding time in May. The stubble crop was mouldboard ploughed and harrowed in May and June, sown immediately and harrowed afterwards, 45 lb. graded pickled seed and 50 lb. superphosphate being used. Germination was good and even, and the plants stooled well. Varieties were very true to type, but disease in the form of flag smut, take-all, and foot rot was present. The crops were very even, but a sprinkling of black oats was noticeable.

The crop that secured second place (310 acres) promised to yield well on an average, but showed lack of uniformity, and lost points for purity of seed, evenness, cleanliness, and condition.

* In the current season twenty crop-growing competitions have been conducted in New South Wales in which officers of the Department of Agriculture acted as judges. It is impossible to publish the reports of all these competitions, but a selection is being made with the object of representing, as far as possible, the very varying conditions under which the competitions were held.

The third crop of 480 acres consisted of eleven varieties, including three varieties of oats (Sunrise, Algerian, and Mortgage Lifter), but was patchy in yield, cleanliness, freedom from disease, condition, and purity of seed. It was also penalised through being on comparatively new ground, and containing a fair percentage of black oats and other weed growth. It was, however, very creditable to one comparatively new to wheat farming.

In Section A, for the best 60 acres of wheat for grain on fallow, Mr. A. Healy again won easily with a magnificent crop of Marshall's No. 3, grown on June fallow, harrowed in July, springtoothed and twice harrowed in August, springtoothed in October, and again in November, March, and May. It will be seen that every opportunity was taken to work this fallow where the occasion warranted it, and the results justified this working. Sowing was carried out in May, using 45 lb. of graded pickled seed and 50 lb. superphosphate. The resultant crop was absolutely true to type and free from strangers, very even and clean, but it lost a few points owing to the presence of flag smut and take-all. It was estimated to yield 32 bushels of well-filled grain per acre.

Second place was filled by Mr. P. Rees, with a very pleasing crop of Turvey, estimated to yield in the neighbourhood of nine bags. It was grown on August fallow, harrowed in October, springtoothed and disced in November, springtoothed in April, and harrowed in May. Sown early in May with 60 lb. of pickled seed and 48 lb. superphosphate, it germinated well and made good growth, was true to type, and reasonably pure, very even, and not diseased to any extent. Points were lost for the presence of black oats and a tendency for the crop to lodge.

In Section B, for the best 30 acres of wheat for hay, Mr. P. Rees won with an evenly grown crop of Turvey, which was true to name, very clean. but slightly tip-frosted. It seemed good for 40 cwt. or more. Second place was awarded to Mr. J. Jones, who exhibited a crop ot Canberra, which would cut nearly as heavily as the winner, but lost points through the presence of strangers, disease, weed growth on new land, and a tendency to go down.

In Section C, for the best 30 acres of oats, the winning crop was grown by Gollasch Bros. on fallow, and consisted of areas of Algerian, Mulga, and Sunrise oats. The ground being new and clean, and the seed pure, the crop scored heavily for type, freedom from disease, evenness and cleanliness. Second prize went to S. R. Jarvis and Son, who had a nice crop of Algerian, Sunrise, and Mortgage Lifter oats, which promised to yield well, but which were grown on wheat stubble, and lost points for wheat admixtures, evenness, and trueness to type.

General Remarks.

Referring again to Section A in which the greatest number of entries was received (twelve), it may be said that the greater percentage was grown on land which had been cropped for several years, although four of the competing crops were on new land, and these were somewhat handicapped by a sliding

scale of points for cleanliness and condition; it is undoubtedly more difficult to produce a clean crop on old land than on new.

Crops generally were very dirty with black oats, barley grass, saffron thistles, &c., but this was to be expected owing to the unfavourable seasonal conditions which existed in the summer and autumn of 1923, when an absence of rain made the working of fallows inadvisable, and consequently weed growth could not be induced to germinate prior to sowing. The object of promoting germination, of course, is that the growth may be fed off with sheep before sowing. In fact, a small flock is now an essential factor in good farming, as it saves labour and horse work in unnecessary cultivations.

In this respect a perusal of the following rainfall records (obtained from the post office at Lockhart), which should be reasonably applicable to the whole district, may be of interest:—

Fallowing period.		Growing period.	
1922—August	174	1923—May	179
September	220	June	660
October	102	July	263
November	Nil.	August	94
December	67	September	184
1923—January	53	October	168
February	Nil.		
March	28		
April	11		
Total	655 points	Total	1,548 points

Crops were in many cases very uneven, especially on low-lying heavy soils, where the almost continuous rains of June and July left patches which became water-logged, resulting in scalded areas and poor germination and stooling of the wheat plants. But unevenness can also be caused by faulty cultural methods in working up the seed-bed, and to provide a show crop strict attention must be paid to even cultivation of the finish-outs and headlands, and the sowing of sound graded seed, true to type and free from admixtures.

Most of the varieties seen were reasonably true to type, but in the majority of cases the crops showed a fair proportion of strangers. This is particularly objectionable, as they are very often of different habits of growth from the proper variety, and the result is actual loss at harvest time, besides a lessening of the crop's value for seed purposes.

Improvement of the seed used on the farm can easily be carried out by all farmers by obtaining a small quantity of pure seed from some reliable source, and breeding up until sufficient of each variety is obtained for the sowing of the main crops. Regular supplies should be obtained, and the work carried on from year to year, care being taken to see that the seed is not mixed on the farm by cleaning out the drill properly, and not sowing on stubble land a different variety from that grown the previous year.

Flag smut, take-all, and foot rot were very prevalent throughout all the crops exhibited, some being worse than others.

LOCKHART Crop-growing Competition—Best Farm of Growing Crops, 1923.

Competitor.	Varieties.	Cultivation.	Previous Crops.	Date Sown	Seed per acre.	Super. per acre	Apparent yield.*	Trueness to type and purity, max. 20	Freedom from disease, max. 20.	Evenness, max. 20.	Cleanliness.†	Cultivation.†	Total. Points.
					lb.	lb.							
1. A. Healy, "Templemore," Lockhart.	Marshall's No. 3, College Purple, Bomen, Minister, Gresley.	June-July fallow; harrowed, springtoothed August, and twice harrowed, springtooth cultivated November, March and May; portion stubble, mouldboard ploughed May and harrowed again after drilling.	Old land	May-June	45	50	25	19	17	18	27	27	133
2. M. J. Doherty, "Innisfail," Lockhart.	Bomen, Canberra, Turvey, Minister.	July-August fallow, mouldboard, harrowed and disced September, springtoothed and rolled May, portion springtoothed in November, harrowed in February, portion disc ploughed in April, springtoothed and harrowed May.	Part new ground; some old land	May	58	30–50	23	18	18	18	24	24	125
3. S. R. Jarvis and Son, "Taunton," Lockhart.	Federation, College Purple, Turvey, Canberra, Bomen, Gallipoli, Firbank, Yandilla King. Oats—Sunrise, Algerian, Mortgage Lifter.	July fallow disc ploughed: springtoothed in October, February and May, balance stubble ploughed and one-way disced in May, harrowed after drilling.	New ground, second and third crops	April-May	40–60	30	22	18	18	17	24	23	122

* One point for every bushel apparent yield of wheat, 1 point for every 1½ bushels apparent yield of oats.
† First crop, 24 points, second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

LOCKHART Crop-growing Competition—Best 60 acres Wheat for Grain on fallow, 1923.

Competitor.	Varieties.	Date sown.	Seed per acre.	Super. per acre	Number of previous crops.	Apparent yield.*	Trueness to type and purity, max. 20.	Freedom from disease max. 20.	Evenness, max. 20.	Cleanliness.†	Cultivation.†	Total. Points.
			lb.	lb.								
1. A. Healy ...	Marshall's No. 3 ..	May, 2nd week	45	50	16	32	20	17	19	28	28	144
2. P. Rees ...	Turvey	May, 1st "	60	48	8	26	19	18	19	27	26	135
3. M. J. Doherty	Bomen	May, 2nd "	58	30	New ground	28	17	18	20	24	24	131
4. S. G. Chambers.	Federation	May, 4th "	45	40	7	26	18	16	19	26	26	131
5. T. Lane ...	Turvey	May, 1st "	50	56	7	26	18	17	18	24	27	130
6. G. G. Westblade.	Federation	Apl., 3rd "	58	60	Old land ...	28	18	16	17	25	24	128
7. J. Jones ...	Canberra	May, 2nd "	60	60	New ground	28	18	18	19	23	21	127
8. Gollasch Bros.	Gresley, Bomen, Warden, Minister, Yandilla King.	May, 2nd "	60	56	"	24	19	18	19	23	23	126
9. J. E. Wilson...	Bomen, Turvey, College Purple.	April-May ...	60	56	8	22	19	15	17	26	26	125
10. S. R. Jarvis and Son.	Federation, College Purple.	May	45 60	30	New ground	24	19	18	18	23	23	125
11. A. Salan ...	Turvey	Apl., 2nd week	60	60	Old land ..	23	20	16	16	25	25	125
12. D. Mathews	Federation	April-May ...	45	45	8	23	16	15	18	23	24	119

* One point for every bushel of apparent yield.

† First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

The spread of flag smut in wheat crops in all districts during the past few years has been rapid, and should be viewed with some concern. It is taking toll of a good percentage of many crops, and its control is not easy. It cannot be prevented in the same manner as bunt or stinking smut, as, though pickling of the seed with a fungicide is advisable as a certain amount of infection may take place from spores adhering to the seed, the greatest source of infection is in the soil, carried over from the previous crop. Measures of control recommended are burning off stubbles, early fallow, and frequent workings of the fallows in order to induce germination of the spores, which will then perish if they have not a host to live on. Rotation of an oat crop is also recommended on badly infected land

The above remarks are also applicable to the control of take-all and foot rot, which are taking a fair toll of crops in this district

Bunt was not noticed, and, as in every instance competitors had pickled their seed, apparently the methods adopted for prevention are effective.

Manuring was general and the average amount used was 50 lb. per acre. Of late years the tendency has been to increase the amounts used, and profitable results have been obtained from even as much as 112 lb. per acre.

The amount of seed used averaged 54 lb., and here also the tendency has been to increase the quantity, especially of late-sown early-maturing varieties, which are known not to be heavy stoolers.

The Eugowra Competition.

W. D. KERLE, Senior Agricultural Instructor.

The first local competition judged in the Royal Agricultural Society's wheat-growing competition in the south-western area was that of Eugowra. Eleven competitors submitted blocks of 50 acres each, and the judge placed them in the following order. -

Competitor	Variety	Trueness to type, 20	Freedom from disease, 20	Evenness, 20	Cleanliness *	Condition and appearance †	Apparent yield ‡	Total
1. Carman Bros, Murga	Canberra	19	18	19	27	26	29	138
2. Mulligan Bros, Eugowra	,,	19	17	19	26	26	27	134
3. M Dwyer, Vychan	,,	19	18	17	26	24	28	132
4. L R. Barrow, Eulimore	Yandilla King	17	17	17	24	22	27	124
5. C. O'Brien, Murga	Canberra ...	19	16	16	25	20	27	123
6 Y. H Walker, Eugowra	Federation	18	17	16	22	25	22	120
7. A. W. Couch, Eugowra	Canberra ...	18	13	17	27	22	22	119
8. A. R. Bowes, Eugowra	,, ...	18	13	17	24	21	21	114
9. C. H Townsend, Eugowra	,, ...	10	17	17	21	21	24	110
10. T Mulligan, Eugowra	,, ...	16	14	14	21	21	19	105
11. A. I McMillan, Eugowra	Waratah and Federation	19	17	11	23	15	19	104

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29 over six crops, 30 points.

† First crop, 24 points; second, 25; third, 26; fourth, 27; over four crops, 28 points.

‡ One point for every bushel of apparent yield.

The winning crop was an excellent one of Canberra sown in the middle of June at the rate of 60 lb. of seed and without fertiliser. It was of excellent type, very evenly headed, and nice stooling and density. It was the eleventh crop and remarkably free from weeds and diseases under the circumstances. The grain was filling nicely, and the straw a rich golden, particularly healthy colour; very uniform in height and even throughout; grown on rich alluvial soil. Preparation consisted of mouldboard ploughing in March, harrowing in April, and springtoothing prior to sowing in the middle of June. No fertiliser has ever been applied to the soil. Viewed in the light of present day experience this crop, grown on stubble land, should be well down on the list, but to local farmers successful working of the strong alluvial ground on the Mundagery and other tributaries of the Lachlan, as well as the Lachlan bank lands themselves, is known to depend on continuous cropping, with the idea of taking the strength out of the ground, resulting in much less rank growth, and less tendency to lodge, and a much more uniform crop. Continuous cropping in the hands of careless farmers means that black oats and other weeds and take-all and similar fungus diseases will in a very short time be very prevalent. It is, therefore, every bit as meritorious for the winners of this competition (who in their eleventh successive season have produced a crop so comparatively free from weeds and fungus diseases) as for a grower on more typical wheat land under the more orthodox method of fallowing

The second prize winners submitted a very excellent crop of Canberra on ground which had had over twenty previous crops, and had been fallowed only twice (in 1916 and last year). The ground was mouldboard ploughed in July of last year, harrowed in August, one-way disced in March, and sown at the end of May. Seed was applied at the rate of 52 lb. and superphosphate at 30 lb Considering the number of crops which had previously been taken off this block it was remarkably free from weeds and disease. Black oats were not much in evidence, star thistle in patches being the worst weed Flag smut and foot rot were present in the crop and to a less extent take-all.

This crop was in excellent condition, ripening off evenly a deep golden colour, and with well filled ears. It was thin in places, which reduced the yield, and generally it could have done with a heavier seeding and manuring.

The third was a very nice crop of Canberra of excellent type and in good condition. It was rather uneven, one portion of the paddock which was fallowed a little earlier showing a difference of quite two bags in the yield. Black oats were not much in evidence, but portion of the paddock showed considerable undergrowth. This was the eleventh crop, and was very free of disease in the circumstances. Flag smut, foot rot, and take-all were present, but to comparatively little extent. The paddock was estimated to yield an average of 28 bushels.

The crops were not, on the whole, up to the standard of last year, owing to the less favourable season. It appeared that flag smut and foot rot were both more prevalent than last season, particularly the former. Bunt was conspicuous by its absence.

The general condition and yields of the competing crops were well above the average, but on the whole Eugowra farmers follow the best practices. They are in a district which is comparatively safe, but they still leave nothing to chance. Evidences of good fallowing were to be seen in plenty, and in conversation, or when inspecting growing crops, one was convinced that growers were alive to the necessity of fallowing, to the benefit of pure graded seed of good type, and to the fact that fungus diseases are on the increase and must be tackled from the ground up.

The Inverell Competition.

MARK H. REYNOLDS, Senior Agricultural Instructor.

The crops of thirteen farmers were inspected in the crop-growing competition organised this season by the Inverell P. and A. Association, that of Messrs. E. Jeffrey and Sons, who put in 50 acres of Marquis, Rymer, and Canberra, winning first place.

The previous cropping on this land had been wheat in 1920 and 1921, and linseed in 1922; a crop of wheat had been grown previously to 1920. The 1922 linseed crop failed owing to insect destruction, and the residue of the crop together with a liberal growth of wild turnip, mustard, &c., was fed off by stock. The land, typical black clay loam, was shallow-ploughed when in a dry condition in February, no further cultivation being given until the drilling in of the grain on 15th June in a dry seed-bed unmanured. Prior to sowing, the seed was treated with bluestone of a strength of ½ lb. to 4 gallons; 50 lb. seed per acre was sown, and the rains of late June caused a good germination and stand. The rainfall benefiting the crop was as follows: June, 397 points; July, 180; August, 21; September, 300; October, 250; November, nil. The crop was not harrowed but was fed off twice with heep, the sheep being taken off the crop on the last occasion on 1st September. Notwithstanding this very late feeding off, the crop attained the following heights:—Canberra, 2 feet 6 inches to 2 feet 9 inches; Marquis, 2 feet 10 inches to 3 feet 6 inches; and Rymer, 3 feet to 4 feet 3 inches. The elevation of the Inverell district (1,900 feet) must be considered.

The evenness of the crop was satisfactory for the soil and conditions. this crop had the best density of any and the stooling was very good for a grain crop, and there was an absence of excessive flag so common on the rich soils. Considering the crop was sown dry and that autumn rains were lacking to cause germination of weeds, oats, &c., the paddock was exceptionally clean, only a very few black thistles, wild oats, and mustard and prickly lettuce being noticed, and these were stunted generally. Throughout

the inspection only one ear with bunt was found and no other disease had apparently affected the crop. Apart from the Canberra section, the field was very free from strangers. In the Canberra, owing to one of the three drills utilised at seeding not being cleaned out, there was a considerable admixture for a few turns of the drill.

Mr H. R. Gobbert's section consisted of Bomen variety. Altogether four crops of wheat have been taken off the land; no fertiliser has at any time been applied. In 1920 a good yielding crop of wheat was grown; in 1921 the land was left out when a crop of thistles, &c., took possession; and in 1922 it was sown to maize for grain, a fair yield being obtained. Generally the soil is chocolate coloured with less fertile red patches.

The seed was broadcasted by hand from 5th to 19th July at the rate of 40 lb. to the acre, and ploughed in to a depth of 3½ inches. Other than that given to the maize crop, no cultivation except the ploughing in of the seed was given. At the time of sowing the soil was damp, but on the dry side for safety. Shortly after sowing, rains caused satisfactory germination. The density of the crop was very good and very satisfactory distribution of the seed was evidenced. The rainfall benefiting the crop was:—June, 379 points; July, 80; August, 75; September, 261; October, 372; November, nil. The crop, which in early stages was fed off by sheep, grew to a height of 3 to 4 feet. It was of good density, stooling freely and without excess of flag. No bunt was noticed and only a small percentage of loose smut. There was but little weed growth, only a few wild ivy and dock plants.

The feature of this crop was its density, evenness, general vigour, and freedom from admixture with other varieties. A minor tip, due to the dry conditions, and uneven ripening, due to variation in the soil, were the two outstanding drawbacks.

Mr. A. H. Wood's entry consisted of three varieties—Queen Fan, Canberra, and Comeback. Off the same land in 1921, 30 bushels of wheat per acre was harvested, and a 50-bushel harvest of maize in 1922. The soil was thick clay loam of basaltic origin, black in colour, characteristic of the better-class black soils of the district. The seed, which was treated with a proprietary preparation for bunt, was broadcasted by a spreading apparatus attached to a cart, at the rate of 50 lb. per acre. Portion of the crop was sown early in June, and the balance early in July. No fertiliser was sown.

Rain fell shortly after sowing, and caused a good germination. The early-sown portion was fed off by sheep twice; the late sown was not fed. The crop at time of inspection was partly in the milk stage of grain development. The height was 3 feet to 4 feet 6 inches, and the density of the crop was good. Bunt was prevalent in the Comeback and odd patches were apparently affected with take-all. Prickly lettuce occurred to a minor extent in the stubble, but the crop was generally very free from weeds. The admixture of other varieties of wheat was marked in two of the varieties.

Mr. W. R. Hatcher, jun., competed with a crop of Canberra wheat. No fertiliser had been applied to the land, which consisted of a black clay loam common to the district. The paddock had been cropped for fourteen years—in 1920 to wheat, and in 1921 and 1922 to maize. The last-mentioned crop failed to produce grain and was cut and fed to stock. The seed was treated for bunt and flag smut with the standard strength of bluestone solution (1½ lb. to 10 gallons water). No bunt was noticed when pickling and none was noticed in the crop. Seed at the rate of 1 bushel per acre was broadcasted by hand in the first and second weeks in July and ploughed in. A good germination and plant growth followed. The effective rainfall was as follows :—June, 92 points; July, 140; August, nil; September, 276; October, 260. The crop attained a good height (averaging 2 feet) over the portion sown earlier, but the growth was uneven; the larger area sown later, on the other hand, averaged 2 feet 6 inches and was very even in height, stooling satisfactorily and showing good density and freedom from weeds. The crop was very free from disease, no bunt being noticed, odd plants only being affected possibly with foot-rot or injury from soil cracking. The early-sown portion had dry weather tip affecting quite a third of the ear in some instances and considerably reducing the average yield. But for this the crop would have been awarded a higher position.

Mr. W. Gilholme's crop was a well-grown one. Its main weaknesses were admixture of varieties throughout and being on the late side. It should be classed a good hay crop.

Mr. W. Tonkin's crop of Bomen was liberally mixed, chiefly with one other variety. This competitor entered another crop which was destroyed by hail, and then substituted the crop of Bomen to help the competition

The main fault in Mr. W. White's crop was the prevalence of bunt in the Canberra..

DETAILS of Awards.

Competitor.	Apparent Yield *	Type and Purity Max. 20.	Freedom from Disease Max. 20.	Evenness. Max. 20.	Cleanliness †	Condition and Appearance ‡	Total points
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
E. Jeffrey and Sons, Esdale, Auburn Vale	33	14	16	18	23	24	128
H. R. Gobbert Gum Flat	26	18	16	18	23	22	123
A. H. Woods, Glen Elgin	31	13	14	18	23	21	120
J. R. Hatcher, jun., Rob Roy	24	18	15	16	27	19	119
W. Gilholme, jun., Gum Flat	30	12	16	15	20	20	113
W. Tonkin, Delungra	25	13	16	18	20	19	111
W. White, Little Plain	22	16	10	18	27	18	111
F. C. Hills, Delungra	28	16	14	15	19	17	109
G. D. Woods, Glen Elgin	27	18	10	17	22	20	109
Pollock Bros., Dinton Vale	16	14	15	17	27	16	105

* One point for each bushel of apparent yield.

† Maximum points—first crop, 24 points; second, 25 points; third, 26 points; fourth, 27 points; fifth, 28 points; sixth, 29 points; over six crops, 30 points

‡ Maximum points—first crop 24 points; second, 25 points; third, 26 points; fourth, 27 points; overfour crops, 28 points.

The Corowa Competitions.

H. BARTLETT, Senior Agricultural Instructor

IN the first of its competitions the Corowa society offered a silver cup of £10 10s. under conditions laid down for the best combined fallow and growing crop, with a cash prize of £5 for first, £3 for second, and £2 for the winner of the highest aggregate points extending over a period of three years, starting with the 1923 fallow. The second was an open or sweepstake growing crop competition, open to all financial members of the society residing within a radius of 25 miles of Corowa, for the best 50 acres of standing wheat grown by exhibitor on fallow, not more than two varieties on one block; the first prize to be 60 per cent. of the sweepstake with a special prize of £10 offered by the society, 30 per cent. and £3 for second, and 10 per cent. and £2 for third.

The weather during the inspection of the crops entered was ideal, and the district had evidently had a favourable season. The lack of fallowed land in the district is the more to be regretted when the advantages that have accrued to the practice are considered.

Special attention may be directed to the award table of standardised points approved by the Department of Agriculture for such competitions. In compiling the award table considerable attention was given to the relative importance of each factor in successful wheat production. The value of the crop has been considered in conjunction with the condition in which the crop leaves the paddock for future crops. To illustrate this point, comparisons may be drawn between the crops exhibited by Messrs. Kingston Bros. and that of Mr. R. S. Kinnear, which are separated in the awards by 11 points. Although the latter crop was estimated to yield within a bushel of the former, the most marked difference was in the proportion of straw to grain. Messrs. Kingston Bros.' crop was about 4 feet high, well headed and filled, while Mr. Kinnear's crop averaged 5 feet 3 inches, the heads being somewhat short. The height of such a crop makes harvesting less convenient and a heavy straw crop leaves the land poorer. The crop would have been more profitably cut for hay than left for grain. For this reason, five points were deducted for condition and appearance. Other factors which receive consideration in the scale of points devised by the Department are trueness to type and purity (which determines whether the crop is suitable for seed purposes), and freedom from disease, upon which depends the prospective cropping value of the paddock, as when disease is noticeable it is necessary to alter the cropping rotation to eradicate it.

Evenness is considered in conjunction with the ease of harvesting, while cleanliness is all-important to maximum results, and special attention is given to the presence of wild (black) oats, thistles and excessive undergrowth, all of which rob the land of its fertility, retard development of the grain, and make harvesting more difficult.

Consideration is given under the heading "condition and appearance" to the percentage of straw to grain, the amount of lodging and the liability to lodge with the prospects of the crop reaching maturity and being safely harvested. The yield is estimated on the assumption that favourable conditions will continue until the crop is in the bags.

Remarks under this heading may embrace the fact that the fallowing period was abnormally dry, and gave no opportunity, except between 10th and 23rd May, to cultivate. This dry spell was followed by a period of continuous and excessive rainfall, there being no break of dry weather giving a chance to handle the land properly.

OPEN Crop Growing Competition.

Name	Type and purity. (Max 20)	Freedom from disease (Max 20)	Evenness (Max 20.)	Cleanliness.†	Condition and appearance.‡	Yield points.*	Total points.
Kingston Bros.	17	17	18	29	27	35	143
D. N. Nixon	16	19	19	25	28	33	140
J. T. Clifton	15	16	19	28	26	33	137
P. J. C. Field	15	18	18	25	27	33	136
R. S. Kinnear	14	16	18	27	23	34	132
W. Tait	15	13	18	25	26	35	132
F. W. Knight	18	17	16	24	27	27	129
Knight and Son	15	14	17	28	25	29	128
F. Field	15	17	16	22	26	32	128
A. Clifton	15	13	17	23	23	34	125
W. Longmire	13	15	16	23	24	32	123
J. R. Dye	12	15	15	20	23	27	112

* One point for each bushel of apparent yield.
† Maximum points.—First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.
Maximum points.—First crop, 24 points; second, 25; third, 26; fourth, 27; over four crops, 28 points.

The outstanding crop of all-round excellence was that entered by Messrs. Kingston Bros. It was of Marshall's No. 3, and for purity of type was of great value for seed purposes. It was comparatively free from diseases, even, clean, and of robust appearance, indicating that it should finish well; fourteenth crop grown in the paddock, which was last in wheat in 1921; stubble grazed and then burnt; mouldboard-ploughed in July 4 inches deep. Owing to dry conditions no cultivations were given until sowing. The crop was harrowed after sowing, which began in the middle of May, 66 lb. of graded seed (the product of seed purchased from Wagga Experiment Farm in 1921) being used with 70 lb. superphosphate.

Mr. D. N. Nixon's 50 acres of Federation was remarkable for its evenness, freedom from disease, condition and appearance, somewhat lacking in purity, but of good type. More than fifteen crops had been taken off this paddock, the last being wheat in 1921. It was stubble grazed and burnt off, mouldboard-ploughed 4 inches deep in June, 1922, harrowed in September, disced and

springtooth-cultivated at the end of April, sown with hoe drill 5th May, and harrowed after sowing; fairly heavily fed off late in July; 60 lb. of graded seed and 45 lb. superphosphate were used.

Mr. Jas. Clifton's was a very fine crop of Turvey, which, in common with all other crops of this variety seen, was somewhat lacking in type. It was the seventh crop grown in the paddock, the last being wheat in 1921. This farmer followed the general practice of grazing and burning off. The land was mouldboard-ploughed in September, disc-cultivated in April; sowing took place from 5th May, and 60 lb. of seed and 56 lb. of superphosphate were used.

FALLOW and Wheat Crop Competition.

Name.	Fallow award.	Type and purity. (Max. 20.	Freedom from disease. (Max. 20.)	Evenness. (Max. 20.)	Cleanliness.†	Condition and appearance‡	Yield *	Crop award	Grand Total.
T. Gilchrist	93	16	17	16	25	26	27	127	220
J. Owen	86	15	13	18	20	24	38	128	214
J. Johnson	85	13	18	17	24	26	29	127	212
F. Field	83	15	17	16	22	26	32	128	211
J. J. Gilchrist	91	13	16	16	22	26	24	117	208
Knight and Son	78	15	14	17	28	25	29	128	206
W. Longmire	83	13	15	16	23	24	32	123	206
J. Nagle	93	11	11	17	22	22	29	112	205
P. J. C. Field	67	15	18	18	25	27	33	136	203
R. Sharp	75	11	17	16	25	25	32	126	201
W. and O. Field	73	17	18	16	22	26	28	127	200
Clifton Bros.	80	14	15	15	19	24	31	118	198
J. Naughtin	89	15	14	13	17	23	24	106	195
J. Walsh	75	15	16	14	13	23	21	102	177

* One point for each bushel of apparent yield.

† Maximum points.—First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

‡ Maximum points.—First crop, 24 points second, 25; third, 26; fourth, 27; over four crops, 28 points.

Mr. Thomas Gilchrist, the successful competitor in this section, presented a crop of Federation which was fairly good in type and purity. Traces of smut, foot rot, and ball smut caused a loss of 3 points; fairly even, slightly dirty, but of good condition and appearance. It was the twelfth crop grown on the paddock, the last being wheat in 1921, the stubble of which was grazed and burnt off. It was mouldboard-ploughed in August, 1922, harrowed in October, springtoothed in January, 1923, harrowed in May after the rain and sown 25th May, using 80 lb. seed and 75 lb. of superphosphate.

Mr. Owen's was the heaviest crop inspected in the district, but it lost 5 points for type and purity, 7 for disease (foot rot and take-all being very evident), 7 for wild oats and thistles. The crop also carried too much straw for size of head, and lost 3 points. This crop would have been improved if it had been possible to feed off early in the growing period. It was the fourth crop put in the paddock, the last being wheat in 1921, the straw being grazed

and ploughed in; mouldboard-ploughed 4th June, 1922, disc-cultivated in September, and harrowed after sowing; variety Bomen, sown 25th April, 60 lb. to the acre with 56 lb. superphosphate.

Mr. J. Johnson's crop of Bomen was somewhat lacking in type and purity. It was the fifth grown in the paddock, the last having been wheat in 1921. The stubble was burnt off and the land mouldboard-ploughed in August, 1922, 4 inches deep, harrowed twice in September, rolled and harrowed in April; sown 26th May, using 50 lb. seed and 50 lb. superphosphate per acre.

General Remarks.

After close inspection of the crops it was markedly evident that there is ample room for a great improvement of type and purity of seed in the district. A wise practice to follow is for each grower to purchase annually a small quantity of stud seed from one of the experiment farms with which to form the nucleus of the farm seed supply. Take-all and foot rot are rather too prevalent, and it would be wise if the practical methods advocated for the control of these diseases were followed. In cases of bad infection it is advisable to burn the stubble (without grazing), to cultivate in February and follow with a fallow. If oats can be profitably grown it is a wise plan to include them in the rotation Such methods are undoubtedly most suited to control the black or wild oats, which have depreciated the yields of some of the crops seen to the extent of 6 bushels. Many of the crops inspected would undoubtedly have benefited by feeding off if that had been possible. During seasons such as that just experienced there is a tendency for crops to run to straw at the expense of grain development, which condition can best be avoided by checking the growth in the earlier periods.

To Render Crude Oils Miscible.

VARIOUS agents are used to render crude oils miscible, and of these sodium oleate, ammonium oleate, resin oil and resin spirit are probably more frequently used than any others. The proportions used will no doubt vary slightly according to the various crude oils which it is desired to make miscible, and the quantities used by manufacturers have been adopted by them after careful experimental work, and are consequently retained for their own use and information. Suitable proportions for certain cases could be arrived at by laboratory experiments, but it is doubtful if these results could be satisfactorily put into practice by orchardists generally, on account of lack of necessary facilities and conveniences.

The following procedure for home-made miscible oil, suggested by Purdue University School of Agriculture, is recommended for trial:—

Part I.—Emulsifier—		Part II.—Miscible Oil—	
Minhaden Fish Oil	5 gals.	Emulsifier (as in Part I)	8 parts by volume.
Carbolic acid (liquid crude).	4 ,,	Crude oil	35 ,,
Caustic soda (granulated)...	8 lb.	Resin oil	5 ,,
Kerosene	7 gals.	Water	1 ,,
Water	10 ,,		

—A. A. RAMSAY, Chemist.

The Value of Birds to Man.

Especially in Relation to Agriculture.

J. R. KINGHORN, Zoologist, Australian Museum

THAT birds are man's most valuable and yet least valued possession is a fact which is apparent to the comparatively few people who study them. Man generally considers himself to be the prevailing power on earth, but in this he makes a very big mistake. The insects are the dominant power, and as many of them are carriers of disease which affect man either directly or through his products, while others destroy his works, it will be realised that they are man's greatest enemy. We have many scientists who are working continually in an endeavour to find some reliable mechanical insect exterminator; but while we wait we are apt to overlook the fact that certain species of birds will do the work thoroughly if we give them the chance by encouraging them.

Birds, because of their insectivorous diet, form the greatest army that nature can muster in her endeavour to keep insects from becoming plagues. At times when the balance of nature is temporarily upset, insect plagues may eventuate, and at such times birds and man become allies in the great fight. Unfortunately, man soon forgets the work the birds have done for him, and he fails to give them the protection necessary for their welfare and for his own.

In Australia we have over 800 species of birds, and only about thirty or forty might be considered to be in some way or other destructive; nevertheless, I would like to add that *all* our birds have *some* economic value. Among the smaller and better known feathered friends are such birds as the willy wagtails, blue wrens, tomtits, jacky winter, yellow robin, wood swallows, and thickheads, sometimes known in the western districts as thrushes. All these birds are most valuable in the garden, the orchard, or the open forest, where they wage continual war on the smaller insects, many of which are highly destructive to man. The quail is one of our game birds, and, therefore, a reserve food supply, but it is also a great weed and insect destroyer, and, contrary to popular ideas, grain is seldom eaten. It has been estimated on examination of stomach contents, that one quail eats ½ oz. of seed and ½ oz of insect diet per day; this does not sound very much, but it means that 100 quail in any district would destroy 600 lb. of insects and 600 lb. of weed seeds during the open season, say, March to July. The blue crane is a destroyer of grasshoppers and yabbies or crayfish, which have the habit of

*Synopsis of a lecture before Borenore Branch of the Agricultural Bureau. Published with permission of the Trustees of the Australian Museum

boring in the banks of irrigation canals. Ducks are of value because of the great numbers of water insects which they eat, among which are millions of mosquito larvæ.

The rosellas and white cockatoos are known to be highly destructive, yet even these birds can do some good when they turn their attention to weed and thistle seeds. The black cockatoo, on the other hand, having an entirely insectivorous diet, is most useful in the forest areas, where it wages war on the many beetles and borers which would otherwise destroy most of our timber.

The peewee and the magpie are two of the most valuable ground-feeding birds we have, and they are a great asset to the farmer, inasmuch as they have a special liking for wireworms and cutworms, which, if left alone, would multiply to such enormous numbers that crops would be absolutely destroyed, and even grass or weeds would not be able to grow.

The silver-eye is insectivorous as well as being a fruit-eater; there is no doubt that it plays hovoc with fruit, but during the season when fruit is not available, it lives entire.y upon insects. It is really a valuable bird in the garden, field, and forest, where it destroys myriads of aphids, scale, and other such pests in fruit districts. The cuckoos and cuckoo shrikes are entirely insectivorous, and, therefore, deserve full protection for the valuable services they render.

Starlings and sparrows are curses to the country, as they not only destroy fruit, grain, &c., but drive away many of our useful insectivorous birds. Individually, both birds, especially the starling, have many good points, and it is only when they move about in large flocks that they become destructive.

Swallows have been described as the light cavalry of the bird army. They work continually from dawn to dark, ever on the move, missing no opportunity to destroy insect enemies. They are the natural enemy of the weevil, and should be encouraged to live about the farm in large numbers. Crows and ravens, although undoubtedly destructive in sheep country, have much to be said in their favour. They are great scavengers, being carrion eaters, and, therefore, destroy possible breeding-grounds for that enemy of the sheepman—the blowfly. They do both harm and good, and, therefore, should not be killed as a result of prejudice, but should be carefully observed and protected or destroyed according to whether they are doing harm or good in the districts in which they abound.

The same might be said of the hawks and eagles. Because one may steal a chicken once or twice in its lifetime, the whole family is forever condemned. The natural food of hawks comprises rats, mice, young rabbits, and birds; seldom do they attack man's property, yet they are continually persecuted. A leading American biologist has said that the people who are only too ready to cry out for the destruction of these valuable birds should be the first to ask for their protection.

While most birds work by day, there are also many which feed at night. The great family of owls comprises many species, all of which play havoc with mice, which would otherwise overrun the fields. An Australian zoologist, Mr. A. M. Lea, carried out some investigations relating to the food of the barn owl. He estimated that two pellets were thrown up each day, equalling 730 per year; he, therefore, examined 730 pellets from one locality and found that they contained remains of 1,407 mice, 143 rats, 5 rabbits, 375 sparrows, 23 starlings, 25 other birds, 4 lizards, 174 frogs, 23 night moths, 50 crickets, and 29 other insects. This will afford the reader some idea as to the value of these birds.

The podargus, or morepork, is an insect-eater, and being a night bird, carries on the war started in the daytime by the diurnal birds, mainly against cicadas and moths.

Wood swallows or blue martins, by reason of their gregarious habits, are highly useful in helping to check plagues. I remember that in Bathurst in about 1903, a plague of caterpillars attracted thousands of wood swallows, and the check on the caterpillars by these birds was noticeable in a very short time. As a caterpillar eats about twice its own weight in food per day, a great army of them, if unchecked, would in no time destroy hundreds of acres of grass lands and vegetable gardens.

It is at such times that nature kindly takes a hand, and sends the birds to our aid, but unfortunately we are often only too ready to sit back and let the birds do all the work. As the main features of our Birds and Animals Protection Act were compiled by scientists and naturalists who knew what they were about, it was passed by the Government in the interests of the country. Unfortunately—and mainly through ignorance—many people do not respect the clauses of the Act. Birds are ruthlessly slaughtered, eggs are collected, and the birds are not given a chance at all. If half the energy that is expended in collecting the eggs of protected birds was turned towards collecting the eggs of sparrows and starlings, it should only be a matter of a few seasons before a very appreciable reduction in the numbers of these pests would be brought about, and it would be almost impossible to estimate the good that would result to the country.

Children who want to study nature spoil their own efforts by collecting eggs. The notebook and the camera are not only the most interesting, but the most instructive and useful articles through which a full insight into the life and habits of birds can be gained.

This is what we must remember—nature is wonderfully and delicately balanced. If we reduce its numbers in one direction, the inevitable result will be increased multiplication in another—this means that, if we continue to destroy our valuable insect-eating birds, we must be prepared to bear the brunt of attacks of hordes of insect pests, with disastrous results to ourselves. We must not allow ourselves to be carried away by sentiment or prejudice, but must be guided by facts which are the result of scientific investigation.

We have no right to act selfishly in faunal matters, as the fauna does not belong to us individually or collectively; it belongs to the country. Our Australian birds are both beautiful and useful. They are the greatest national asset which our country possesses—a fact which is unfortunately only too often overlooked. Birds and animals are here for our enjoyment and use, but we are apt to forget that we hold them in trust, and should consider them an everlasting heritage to be handed down to future generations. If some people persist in destroying as they do now, there will come a day when our fauna will be doomed to extinction. Then our folly will rebound with terrific force, having such terrible results as may end in universal disaster. From the point of view of agriculture, we must realise that it is impossible to carry on for any time without the help of birds. Let producers of every order protect and encourage them. They are their true friends and allies.

To Purify Water in a Tank.

An inquiry was received recently as to the best method of preventing the formation of green slime on well water that had been pumped into an iron tank. "The water is clear and fresh," wrote the correspondent, "and I wash the tank out frequently, but within a few days this green slimy stuff appears, and gets along inside the pipes, causing considerable trouble. Kindly advise if there is any uninjurious chemical, or what method I could adopt, to prevent the growth. The water is used for domestic purposes."

The writer was advised to clean out the tank and cover it so as to exclude the light. Simple aeration of the water in the tank by blowing air into it would tend to prevent the abundant development of the algæ (vegetable growths) with their objectionable tastes and smells. The following methods were suggested for chemical purification and elimination of algæ, &c.:—

1. Bleaching powder, used at the rate of 2 to 2½ oz. per 1,000 gallons of water. The chloride of lime should be mixed in a bucket with water, and the contents added to the water in the tank, and stirred through the mass.
2. Prepare a fairly strong solution of permanganate of potash in water. Add this in small quantities at a time to the water in the tank, stirring well after each addition until the bulk water acquires a very faint pink colour. The final depth of colour may be observed in a tumbler.
3. Copper sulphate (bluestone) is a highly effective algicide, and is extensively used in large water reservoirs, but the amounts used must be very accurately measured. It should be used at the rate of one part bluestone to six million parts water, or 12 grains (actually 11·7) per 1,000 gallons.

In using any of the above methods, two tanks may be employed, in one of which the purification process would be proceeding while the other was being used for any necessary purpose.—A. A. Ramsay, Chemist.

Insect Pests of Cotton in New South Wales.

W. B. GURNEY, F.E.S., Government Entomologist.

The Cotton Bollworm (*Heliothis* [*Chloridea*] *obsoleta*).

This pest is the caterpillar of a moth of the family Noctuidæ. The caterpillar is variously known as the cotton bollworm, the maize earworm, and the tomato worm; and it also attacks peas, beans, and lucerne, and where any of these crops are grown it generally makes its appearance. The caterpillars are extremely variable in colour, as also are the adult moths. This pest is wide-spread. It is found in Asia, Southern Europe, Africa, Pacific Islands, North and South America, and has been established in Australia for many years. Maize, tomatoes, peas, beans, lucerne, and tobacco are among its other food-plants. This wide variety of host plants enables the bollworm to survive readily and renders control measures difficult. It is particularly partial to maize, and because of this sometimes neglects cotton more or less when maize is available. This factor may be utilised perhaps in control.

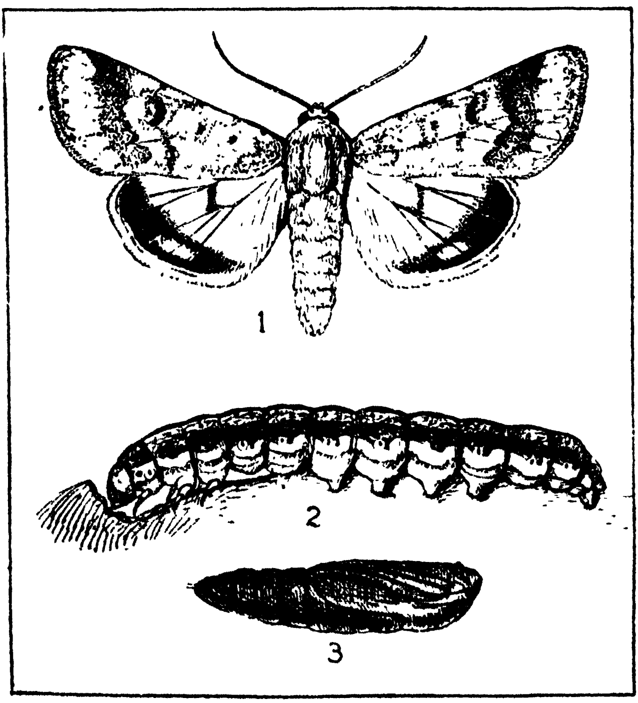


Fig. 8.—A Cotton Bollworm

1. Moth or adult. 2. Larva or worm. 3. Pupa. (Highly magnified).

[*After Howard.*]

Life History.—The number of generations or broods is greater in warmer districts than further from the tropics and varies from two to seven generations each year. Each female deposits several hundred eggs, being capable of depositing from 400 up to as many as 3,000, the average probably being something under 1,000. The eggs are laid singly and at random over the host plants, the female depositing them usually in the dusk and spending several days in thus distributing her eggs. The egg itself is minute (not so big as a pin's head) and round, yellowish to white in colour, which darkens as the grub inside the egg begins to develop. These grubs hatch in from two to eight days after the egg is laid, the incubation period depending upon the weather conditions. The young caterpillars on hatching are whitish with a small black head, but subsequently become darker in colour. The caterpillars eat voraciously and grow rapidly. They feed on

Fig. 9.—Bollworm (*Heliothis*) at Work on a Cotton Boll. (Slightly reduced.)
[*After Quaintenance and Brues, U.S. Dept. of Agric.*

the foliage, squares and flowers, and may bore into the boll, eating it out partially or even entirely. They may attack and thus damage more than one flower or boll, and their damage may therefore be extensive. It has always been observed that the colours of these caterpillars are extremely variable, ranging from pale buff to various tints of yellowish and green darkened with brown or black streaks or patches; occasionally they are nearly all brown or black in colour. The caterpillar moults every few days; that is, the skin is cast and the grub increases in size after each casting off of the skin. There are five of these moults before the caterpillar is full grown, when it is about 1½ inches in length and of the thickness of something less than a lead pencil. It is full grown in from fourteen to twenty-eight days after hatching, the growth being more rapid in warm weather.

When full grown the caterpillar crawls or drops to the ground and burrows into the soil, usually to a depth of from 2 to 4 inches, depending on the hardness of the soil and other conditions. In the soil it forms a cavity or cell and changes to the small brown pupa. In midsummer it remains in this stage for two or three weeks before it changes to the moth stage. In colder months it remains longer in the pupal stage, and the last brood remains as pupæ in the soil for several months, passing the winter in this pupal stage.

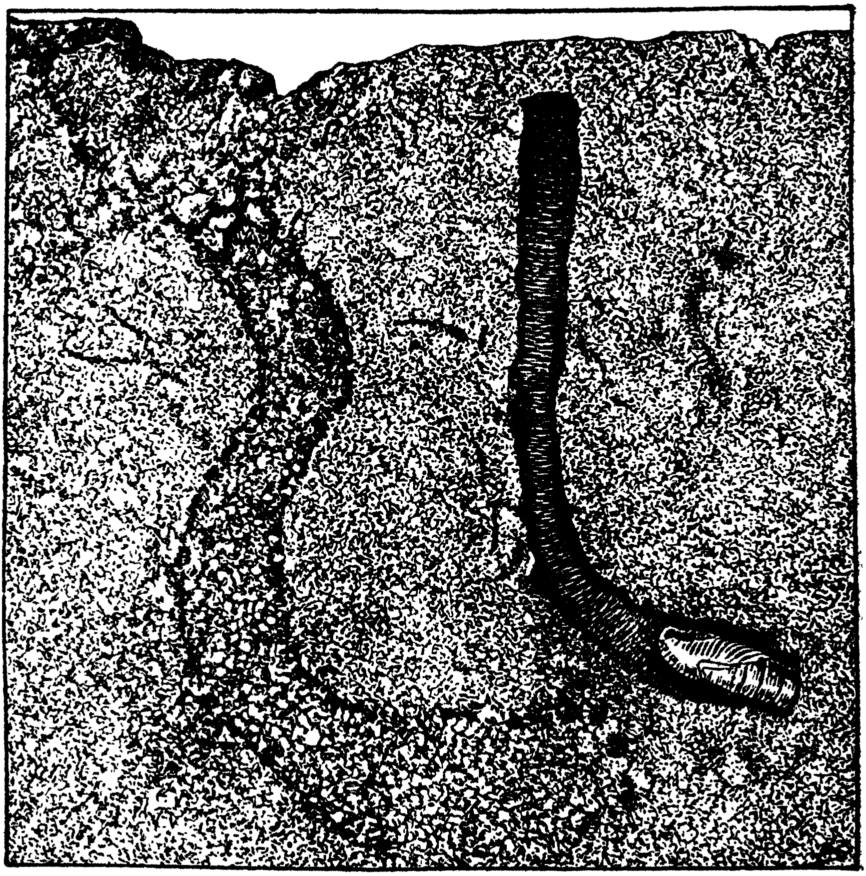


Fig. 10.—Pupa of the Bollworm (*Heliothis*) in the Burrow of the Soil.
[*After Bishopp and Jones.*]

On emerging from the pupal stage, the moth pushes its way to the surface of the soil and there expands its wings. It is not a large moth, being under 1 inch long with wings folded, and with the wings expanded measures only 1½ inches across. The colouration is extremely variable, and may be reddish brown, or pale brown to a light buff. The moths shelter during the

day time and are not very noticeable; but they become active at dusk, when they fly out and feed on nectar or flowers and then, if females, seek suitable host plants on which to lay their eggs.

The entire life cycle from egg to adult moth under warm favourable conditions may be completed in a month, and in warm tropical and semi-tropical districts there may be a number of broods developed throughout the season--up to as many as seven generations. In cooler and temperate districts the number of generations is reduced to two or three at most.

Damage.—The damage caused by the bollworm is wholly due to the caterpillar. The flowers are sometimes seriously eaten out by this pest. A single caterpillar may destroy several flowers or bore into and eat out more than one boll. While it is sometimes a major pest of cotton, it ranks as much less serious than such pests as the cotton boll weevil or the pink bollworm or our yellow maize and cotton moth. On maize it is sometimes a serious pest, and while it may attack both maize and cotton in the same district, it is sometimes recorded that where maize is available it seldom also attacks the cotton. We can reckon, however, that each season some of these caterpillars will attack the cotton crop in the same district.

Fig. 11.--Egg of Bollworm (*Heliothis*). Side and Top Views (Highly magnified.)

Control. Late autumn or winter ploughing exposes and destroys many pupæ in the soil. Destruction of weeds in and adjacent to the crop, and thorough and frequent cultivation through the growing period also reduces infestation, as do also the use of naturally early-maturing varieties of cotton and planting early. In cases of serious infestation dusting with arsenate of lead or calcium arsenate powder may have to be resorted to, though this is expensive. Trap crops of maize in small patches in the cotton field to attract the egg-laying female at the silking stage of the maize and to deter the moths laying on the cotton may also prove an effective measure, but this will depend on whether these moths in our cotton areas are attracted to the maize or not under our conditions.

The Yellow Monolepta Beetle (*Monolepta rosea*, Blackb.).

This is not an introduced pest, but a native of our North Coast river districts. The little beetle is only about one-fifth of an inch in length, with yellow body and legs, and with a bright cerise patch on each shoulder, as well as a single cerise spot near the middle of each wing cover.

Besides cotton, this pest attacks roses and garden plants and the silks and tassels of maize. It is sometimes a serious pest of the orchard, attacking the blossoms and foliage of citrus, stone, and pip fruits indiscriminately. The beetles also swarm on certain species of wattle (*e.g.*, *Acacia podalyriæfolia* and *A. baileyana*), and the pepper tree (introduced) is a favourite food both in winter and summer. It is found in the coastal districts of New South Wales from the Manning River northwards into Queensland.

Observation of the dates of the appearance of this beetle indicates that it has a very lengthy adult life. Its habit of infesting wattle and pepper trees, &c., enables it to survive through the winter. Its absence from early October to early January indicates that the beetles are then hidden in the larval stage, probably feeding in the scrub.

It is the adult beetles which do the damage; they appear in enormous numbers on occasion, and have a habit of aggregating in dense swarms of restricted extent, which move from tree to tree or descend on a patch of cotton, and within a night or two may destroy the whole of the blossom and foliage of the plants attacked. The writer has obtained the eggs of this beetle on several occasions under laboratory conditions, but the natural food-plant of the larva is not recorded.

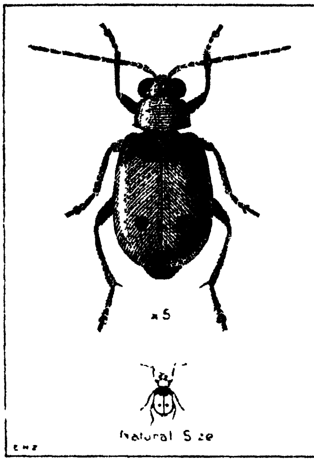


Fig 12.—Yellow Monolepta Beetle (*Monolepta rosea*).

Control.—Dusting infested and adjacent cotton plants with arsenate of lead powder or calcium arsenate powder. If lead arsenate paste only is available, use at the rate of 1 lb. to 15 gallons water. Excellent results have also been obtained by using flares at night in cotton patches where the beetles are swarming, the insects being attracted and burnt in thousands. A sack wrapped round the end of a pole, dipped in kerosene and ignited, is all that is needed.

The 28-spotted Ladybird Beetle (*Epilachna 28-punctata*).

This beetle is common in the warmer parts of eastern Australia, and extends from New South Wales through Queensland to the Northern Territory. Its food-plants are pumpkin, cucumber, and other cucurbitaceous plants, *solanum* spp., weeds, and recently its has been recorded as attacking cotton plants.

Life History.—The adult beetle is a typical rounded ladybird of orange-yellow colour, spotted with black dots to the number of about twenty-four to twenty-eight, though these spots are variable both in size and number. The yellow eggs are conical and laid in patches on the food-plants. The larvæ are of dirty yellow colour with numerous *tubercles* projecting from the upper surface, each *tubercle* clothed with minute black hairs; they feed voraciously on the epidermis of the leaves, as also do the adult beetles, so that both larvæ and adults carry on the damage to the infested plants. The larva pupates on the food-plant attaching itself by its tail and changing to the pupa while hanging head downwards. The adult beetle then emerges from the pupal skin. This insect must not be confused with the black-banded pumpkin beetle (*Aulacophora*) nor its close relative the 18-spotted

ladybird beetle (*Leis*), which is very similar in appearance but is a useful aphide-eating ladybird. The leaf-eating habit of the 28-spotted ladybird and the spiny-bodied grub (which also eats the leaves) should distinguish this destructive species from its useful relative.

Fig. 13.—Spotted Ladybird Beetle (*Epilachna 28-punctata*).
( ) The adult insect, (*b*) larva, side view.

Control.—Spraying or dusting with arsenate of lead readily destroys both the leaf-eating larvæ and the adult beetles. It is important to spray or dust upwards, so as to coat the under-surface of the leaves. Dusting should be done in the early morning or at dusk, rather than at midday, as any dew present causes the dust to adhere more readily.

The Rutherglen Bug (*Nysius vinitor* Bergroth).

This minute bug is widely distributed over eastern Australia, its range extending from South Australia through Victoria, New South Wales and

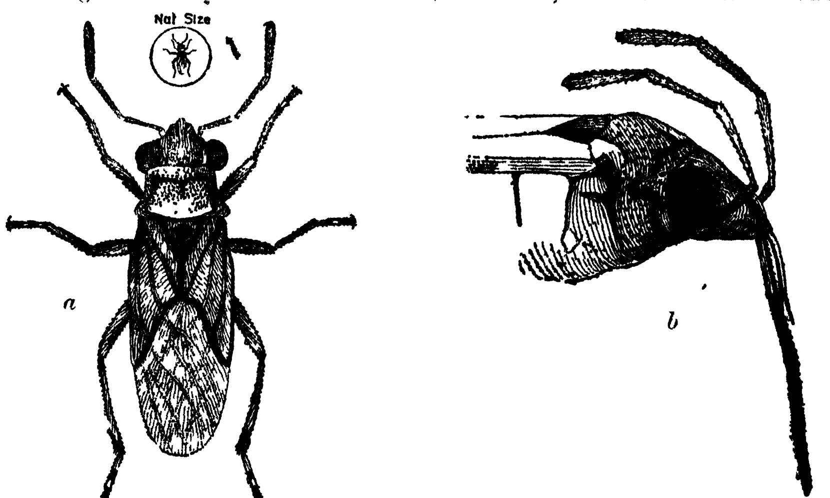


Fig. 14.—Rutherglen Bug (*Nysius vinitor*).
(*a*) View from above, (*b*) head much enlarged, showing beak-like mouth extended.

Queensland. It is both a coastal and inland pest, being, however, more serious inland, where at intervals of several years it sometimes appears in vast numbers in dry seasons. Its food-plants are grasses, weeds, vegetable and field crops and fruit trees, and it occasionally appears on the cotton plant and bolls.

Life History.—The adult bug is minute, brown, with silvery-grey, gauzy wings folded flat on the back; the length is only about one-sixth of an inch. It is very active and runs rapidly over the stems and foliage and takes readily to the wing when disturbed, having the appearance of a small fly, therefore, to the casual observer. It sucks the sap from the stems and foliage, and is commonly seen on the bolls. The minute white eggs are laid on grass, leaves and other food-plants and hatch into minute immature bugs which are wingless. The bugs feed by sucking the sap in the same way as the adult, and after moulting several times within a few weeks reach the adult winged and flying stage.

Damage.—As pests of vegetable crops and fruit trees, the damage the bugs do is serious, for owing to the immense numbers which may be present, sucking sap in all stages of development, wilting and discolouration of foliage and fruit soon occurs. So far we have only observed their presence on cotton in limited numbers, and therefore little damage has been recorded, but should they appear in numbers on cotton in favourable seasons considerable damage may be expected.

Control.—The first step in the control of the Rutherglen bug should be to plough in or cut and burn grass and weeds on headlands in late winter or early spring, and to keep this growth down during the first half of summer, for it is here that the bugs develop and increase, spreading then to adjacent crops. Should the bugs appear in serious numbers, it may be necessary, to dust the plants frequently with slaked lime dust, preferable in the early morning, or to spray with kerosene emulsion or nicotine sulphate, or a mixture of the two. It may be practicable sometimes to control the pest by use of the "hopper-dozer"—a tray containing oil and water drawn between the rows while the plants on either side are brushed towards it, hundreds of the insects being dislodged into the contents of the tray by this means.

(To be continued.)

"No Bank Balance."

The distribution of the rainfall over the fallow and growing periods in the Forbes district was remarked by the judge of the 1923 crop competition, who summed the matter up thus :—"The yields of the district's crops in relation to the rainfall on the growing crop are somewhat disappointing, but it must be remembered that the reserve of moisture in the subsoil was practically nil, and that the crops were in the same position as a man with a family on the basic wage—no bank balance."

The Veterinary Surgeons Act, 1923.

An Outline of the Provisions

R. B. SYMINGTON, Department of Agriculture.

THE Veterinary Surgeons Act, 1923, which was passed during the recent session of Parliament, is a long-overdue piece of legislation. By imposing a reasonable standard of qualification for entrance to the veterinary profession, and thus protecting stockowners who seek competent assistance in fighting disease, it will undoubtedly be of great advantage to the State. Legislation regulating the practice of veterinary surgeons was passed in Great Britain as far back as 1844. A Veterinary Surgeons Act was passed in Victoria in 1887, and most of the other States already possess such legislation.

The first definite encouragement given to the study of veterinary science in this State was the establishment of the Department of Veterinary Science at the University of Sydney in 1909. It was recognised immediately it was established that an Act to regulate the practice of veterinarians was necessary; but although a Bill was drafted and has been brought before Parliament on a number of occasions, nothing practical was accomplished until the present Minister of Agriculture took the Bill in hand and piloted it through all stages until it has now finally become law

It was necessary not only to provide for the registration of graduate veterinary surgeons, but to safeguard the interests of those who, by experience in the treatment of stock, had attained a reasonable standard of competency. Liberal treatment has been accorded to these last-mentioned practitioners, and it can be claimed that no one who is reasonably capable of attending stock for disease or accident will be debarred from registration The registration of veterinary surgeons will be carried out by a board, on which graduate and non-graduate practitioners will be represented. Registration once granted, must be renewed annually by payment of a fee which will be prescribed by regulation.

No person except a registered veterinary surgeon will be permitted to practise as a veterinary surgeon or to use the terms "veterinary surgeon" or "veterinary," but a proviso enables a person to attend animals in cases where the services of a registered practitioner are not available, and the restrictions are also made inapplicable to such minor operations as castrating, speying, and dehorning. A period of six months is given in which to effect registration.

Some fear may be felt that this legislation may place difficulties in the way of stockowners in that they will be unable to secure veterinary assistance as readily as at present. The liberal provisions regarding registration and the proviso mentioned in the last paragraph should, however, undoubtedly remove any such danger, while the encouragement given to qualified practitioners should soon cause an increase in the number of those available.

Sclerotinia Rot of Passion Vine.

W. A. BIRMINGHAM, Assistant Biologist.

SCLEROTINIA rot, which is due to a parasitic fungus—*Sclerotinia* sp.—frequently attacks the stem of the vine at about the ground level. It manifests itself as a white mould growth on the surface of the stem; the bark becomes rotten, and falls away, exposing the wood fibres.

Stem of Passion Vine affected with Sclerotinia.
The bark is laid back to expose the wood and the black bodies.

In between the decayed bark and wood, hard black bodies (Sclerotia) are formed, as shown in the accompanying illustration. This is one of the means by which the fungus is propagated. The sclerotia give rise to small trumpet-shaped structures, which produce the spores in great numbers. That part of the stem below where it is attacked often shows pronounced swelling, and vines attacked by the disease turn yellow and wilt.

Sclerotia are often to be found in the central cavities of the branches, where they assume the form of the space in which they are confined, *i.e.*, long, narrow, cylindrical bodies. At the point of attack on the stem they are often flat and irregular in shape.

The fungus usually gains entry into the plant through injuries, mostly brought about by the implements used in cultivation. Lack of drainage predisposes the plants to attack.

Diseased plants should be removed and burnt, care being taken in the operation to prevent the black bodies from being scattered about. An application of freshly slaked lime to the soil is recommended, and it is important to avoid injuring the plants in cultivation.

The photograph accompanying this note was taken by Mr. W. J. Reay from a vine grown at Narara Viticultural Nursery.

Experiments in the Cleansing of Fruit Cases.

TRIALS were carried out at Bathurst Experiment Farm recently to ascertain how long a fruit case must be immersed in boiling water to kill codlin grubs in cocoons. It was found that when the grubs were located in the joints of the cases a mere dipping in and out was not sufficient. To kill them all an immersion of three minutes was required.

Up to four times the ordinary fumigating strength of cyanide proved insufficient to kill codlin moth grubs in the cocoons and in bandages.

A Successful Attack on Cutworms.

THROUGHOUT the district of Gosford cutworms were very bad about the middle of October. Considerable damage was done to plants, particularly tomatoes, many growers having to make several plantings before obtaining a good stand.

Throughout this nursery and vineyard they were also very numerous, and at one time we were finding fifty and more cutworms round each vine. This was in ground that had not been cultivated until late in the season. Where the land had been cultivated and kept free from weeds and rubbish it was also fairly free from cutworms. The block of vines where the cutworms were so numerous was taken in hand immediately and sprayed with arsenate of lead. The following evening a poison bait, made of 1 lb. paris green, 24 lb. bran, and 9 quarts water in which 9 ounces of salt had been previously dissolved, was laid.

Another section was treated with the poison bait only. Not many dead worms were found the following morning, but on the second day fully 80 per cent. of the cutworms round each vine were dead. The vines sprayed with the arsenate of lead showed no better results than those that received the poison bait only, so the spraying was not repeated. On the third evening a fresh supply of poison bait was laid. The following morning the remaining cutworms appeared listless, and towards evening all were apparently dead. Nine days after application the bed was apparently free from cutworms.—H. G. WHITE, Superintendent, Narara Viticultural Nursery.

Agricultural Seeds from Overseas.

EFFECT OF THE VOYAGE ON GERMINATION CAPACITY.

A. W. S. MOODIE, Assistant Agrostologist.

THE results of the following small experiment may be of interest to importers of agricultural seeds who purchase supplies from Europe, Asia, and America, particularly from the first named continent. While it is usually impossible to obtain information regarding any abnormal conditions of storage of a parcel of seed found on arrival at Sydney to give a poor germination, information obtained from an experiment carried out under shipboard conditions should be of value, even though it may only prove that the germination capacity of most agricultural seeds is not affected by the temperature prevailing during the voyage. Proof of this fact would enable inquiries to be made on other lines.

Occasionally a parcel of seeds is received from abroad, which gives very poor results when tested for germination, although guaranteed to be of a certain standard by the firm despatching the seeds at the overseas port. The same conditions eventuate occasionally with Australian-grown seed shipped overseas. Obviously it is difficult to form any definite conclusions on the subject in view of the facts known regarding the amount of dry or moist heat some seeds can be subjected to without the power of germination being affected adversely. Under ordinary conditions the majority of agricultural seeds imported into Australia should quite easily reach this country with the germination capacity unimpaired. Possibly certain conditions of storage are responsible for such deterioration as occurs, and the question arises: Is the vitality of seeds affected by storage at varying temperatures and sometimes over an extreme range of temperature for six or seven weeks on board ship? It was with the idea of investigating this matter as far as possible that Mr. R. A. Finlayson, of Hurst and Sons Ltd., seedsmen, London, made arrangements with the chief refrigerating engineer, s.s. Esperance Bay, and with this Department, to carry out the experiment described below.

Seed was stored on board the "Esperance Bay" in three places, as follows:—

(1) Store room, temperature range 85 to 121 deg. Fah.
(2) Tank room, temperature range 25 to 36 deg. Fah.
(3) Cabin, temperature range 59 to 92 deg. Fah.

The period of storage was forty-six days. The following table shows the daily record of temperatures for the voyage:—

	Tank Room	Store Room	Cabin	Date	Tank Room	Store Room.	Cabin.
	deg. Fah.	deg. Fah.	deg. Fah.		deg. Fah.	deg. Fah.	deg. Fah.
2 Sept. ...	31	110	88	23 Sept ...	27	98	80
9 „ ...	31	112	92	24 „ ..	27	98	78
10	35	120	90	25	26	94	68
11 „ ...	36	121	91	26	26	94	68
12	35	116	90	27 .. .	26	92	68
13	33	105	78	28 .. .	26	90	62
14 „ ..	31	98	78	29	26	86	59
15	30	104	84	30 „ ..	26	86	59
16	30	106	85	1 Oct. .	26	86	62
17	30	106	86	2 „	24	85	66
18	30	105	85	3 ..	25	87	60
19	30	103	88	4 „	25	88	62
20	30	102	85	5 ..	25	89	62
21	30	101	85	6 ..	26	90	62
22	28	101	82	7 ..	26	90	62

On arrival at Sydney the seed was tested for germination with the following results.

Variety.	Test before leaving England.	Tests on Arrival in Sydney.		
		Kept in Tank Room 25 to 36 deg. Fah.	Kept in Store Room, 85 to 121 deg. Fah.	Kept in Cabin, 59 to 92 deg. Fah.
	Per cent.	Per cent.	Per cent.	Per cent.
Cocksfoot (*Dactylis glomerata*)	92	68	68	62
Crested Dogstail (*Cynosurus cristatus*)	82	70	67	45
Italian Rye (*Lolium italicum*)	94	93	87	95
Red Clover (*Trifolium pratense*) ...	90 + 3	91	91	82
Perennial Rye (*Lolium perenne*)	84	83	73	74
Meadow Fescue (*Festuca pratensis*).. .	91	86	73	53

It will be seen from these figures that the seed stored in the tank room gave the most uniform results for all varieties. The range in temperatures in this case only amounted to 11 deg. Fah., whereas in the store room and cabin the variations amounted to 36 and 33 deg. Fah. respectively. So far no very definite conclusions can be drawn from these results, but it is possible that the vitality of some varieties of seeds is affected by variations of temperature over such a period as the above. Samples of seeds of varieties of crops largely used in Australia have been forwarded to Mr. Finlayson for testing, the conditions of transport to be similar to those mentioned above. The results of these tests will be made available in due course.

DIRTY land cannot be cleaned with one fallow, but continuous good farming eliminates weed seeds. Aim at preventing weeds from seeding, and the production of clean crops becomes a simple job.—H. BARTLETT, Senior Agricultural Instructor.

The Production of Comb Honey.

[Continued from Vol XXXIV, page 896.]

W. A. GOODACRE, Senior Apicultural Instructor.

THE quantity of material to be prepared for any coming season will depend to a large extent upon the prospects offering on the flora, the bee-farmer's experience, and his capacity to handle and dispose of a crop.

Apiary Management.

As in the production of extracted honey, the comb-honey producer will commence well in advance of the honey season to prepare his colonies, so that the best results may be gained. Particular attention must be given the bees during the autumn to have the colonies go into winter in a populous state, provided with an ample supply of good food, and comfortable and compact conditions in the hive. To get the force of bees desired, a young vigorous queen and good brood combs in the brood chamber are necessary. With progressive conditions obtaining during the autumn the bees should store the necessary surplus for winter and early spring requirements. It is generally considered that 20 lb. of surplus stores is desirable for a medium strength colony, but for the best results this quantity should be considered as a minimum only. Any needy colonies should be fed by supplying combs of honey from a healthy source, or with sugar syrup. To make the colonies compact for winter, at the close of the season remove any surplus supers above the requirements for comfortable accommodation of the bees. Reduce the entrance to winter size, and see that the hive is sound to prevent draughts through the cluster.

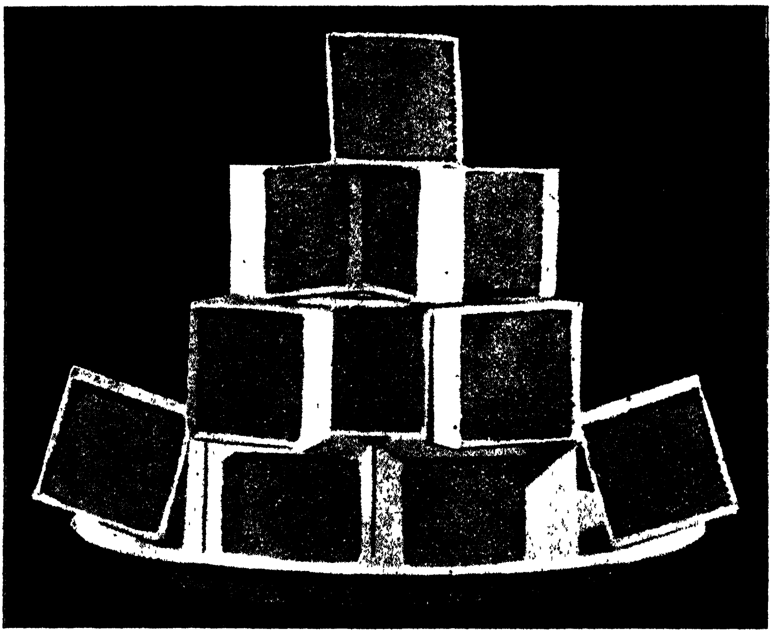
Spring Work.

In the building up work of the colonies during spring, if the necessary large force of bees is to be available at the commencement of the honey flow, the colonies should be given every encouragement. While in this work a good deal depends upon the conditions in the fields, much also depends on the apiarist's care and manipulation of his stocks. The essential points in the spring management are the provision of an ample supply of stores at all times to stimulate a desire for brood rearing, sufficient hive accommodation to minimise swarming ideas, and careful manipulation of the brood nest to allow for expansion without excessive spreading of the brood. In the provision of sufficient accommodation, it may be necessary to have one or two shallow supers containing extracting combs on the hive. The supers of sections are not put on until the honey flow commences in earnest; the white tipping of the comb, the flight and activity of the bees, and keen observation inside the hive will clearly indicate when the right time is at hand to effect the change from the extracting procedure to comb-honey production.

While up to the time of the main honey flow, the expansion of the brood nest and rapid increase of population is aimed at, when the flow is on and supers of sections in operation the tendency on the part of the bees is to contract the brood nest. Hence the vital importance of the large force of bees in the hives at the commencement of the comb-honey production. The operation of sections over weaker stocks cannot be advocated as a paying business.

Working Supers of Sections.

Generally when the flow is right for the placing of supers of sections, the bees will have filled the extracting super combs which are on the hives to provide accommodation. After the honey is extracted from these, they can be carefully stored for the time being. Any brood found in the supers can be distributed among the weaker stocks able to care for it.



Choice Sections of Comb Honey.

[*After Dadant.*

After removal of the extracting supers, a super of sections is placed on each hive. If no bait sections are available from the previous season's operations for distribution among the section boxes, a good method of getting the bees to start work readily is to remove a row of sections from about the centre of the super, and in their place insert a super comb. Once the bees have made a start in the sections, the super comb can be removed and the row of section boxes replaced. If the colonies are in the right spirit,

and the honey flow a good one, the bees, being used to working ., the extracting supers, should make a ready start in the sections, practically covering the whole of them.

When a good start has been made in the first super, it is lifted up and an empty one placed underneath it. When a third super is needed it is placed in the position occupied by the second, and the second one is removed to the top of the hive. Generally by the time a fourth super is required, the first super is completed and ready for removal.

When the honey flow shows signs of slackening down do not add any further supers of sections, the main idea then will be to get as many as possible of these on the hives completed before the close of the season. A super of extracting combs may be put on top of the hive to provide for any surplus while the sections are being completed. At the close of the honey flow the apiarist will have again reverted to the extracted honey procedure. Supers of comb-honey should be removed from the hive as soon as they are completed, or at the close of the flow when no further work is likely to be done in them, because the surface of the comb is liable to become travel stained and its good appearance spoiled.

(To be continued.)

An Australasian Goat Breeders' Association.

Some two or three months ago the formation of a goat breeders' association was suggested in this *Gazette*. Mr. E. F Lane now informs the Department that an association, under the title of the Australasian Angora and Milch Goat Breeders' Association, has been formed for the purpose of developing the industry locally. Persons interested are invited to communicate with Mr. E. F. Lane, Enalfern, Burgooney.

Shot-hole Borer in Fruit Trees.

Specimens of wood from fruit trees were submitted for examination recently for an opinion as to the nature of the pest which had attacked them and advice as to treatment. The wood showed the characteristic tunnels of the shot-hole borer (*Xyleborus solidus*). In neither the larval nor the adult stage do the insects feed upon the wood tissue, but upon a fungus that grows upon the walls of the tunnel, the latter being constructed as a home in which successive broods of the insects are reared. Trees attacked by beetles of this type are usually old or have lost some of their vigour. If the tunnels are very abundant the only thing to be done is to cut out and destroy the infested wood. If they are few the beetles can be killed by injecting into the tunnels a small quantity of carbon bisulphide or kerosene.—W. B. Gurney, Government Entomologist.

Pure Seed.

Growers Recommended by the Department

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat:—

Aussie	Manager, Experiment Farm, Wagga.
Canberra	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Wagga.
	Manager, Experiment Farm, Temora.
Clarendon ...	Manager, Experiment Farm, Glen Innes.
Cleveland	Manager, Experiment Farm, Bathurst.
Early Bird	Manager, Experiment Farm, Wagga.
Federation ..	Manager, Experiment Farm, Wagga.
	Manager, Experiment Farm, Temora.
Firbank	Manager, Experiment Farm, Wagga.
Florence	Manager, Experiment Farm, Glen Innes.
Genoa	Manager, Experiment Farm, Glen Innes.
Gresley	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
Hard Federation	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Wagga.
	Manager, Experiment Farm, Temora.
Marshall's No. 3	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Wagga.
Major	Manager, Experiment Farm, Wagga.
Riverina ..	Manager, Experiment Farm, Wagga.
Wandilla ..	Manager, Experiment Farm, Wagga.
Waratah	Manager, Experiment Farm, Wagga.
	Manager, Experiment Farm, Temora.
Yandilla King ...	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Wagga.
	Manager, Experiment Farm, Temora.
Zealand	Manager, Experiment Farm, Wagga.

Oats:—

Algerian	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Temora.
Guyra	Manager, Experiment Farm, Glen Innes.
Mulga	Manager, Experiment Farm, Glen Innes.
Sunrise	Manager, Experiment Farm, Temora.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Orchard Notes.

JANUARY.

W. J. ALLEN and W. LE GAY BRERETON.

IN coastal areas, where early deciduous fruits are chiefly grown, the bulk of the crop will have been marketed by the middle of January, but in the inland and tableland districts, where later varieties of stone fruits are produced, the season, except for cherries and apricots, will only be just under way, and the apple and pear harvest, except for a few early varieties, is still later.

Although there are exceptions, on the whole the indications are that the stone fruit crops will not be more than a fair crop this season.

In handling stone fruits for the fresh market it is, of course, necessary to pick them while they are firm or they will arrive at their destination in a mushy wet condition. The degree of maturity to which they can be allowed to come before picking depends largely on the distance that separates the orchard from the market. Then, too, it is sometimes necessary to hurry the fruit off to escape attacks by birds, or a grower, in order to catch a good market, will pick earlier than usual. But, whatever the reason, undoubtedly a certain proportion of stone fruit reaches the market in a quite immature condition. It is true that retailers require this class of fruit in a condition in which it will stand a day or two while waiting sale, and shippers even require it a bit harder still, but it must be remembered that unmatured fruit has an unattractive appearance. Often fruit left on the trees only a day or two longer loses the flatness of the sides, and thus gains an appearance of better size, and also will not wilt so readily as when picked too early. Fruit picked too green will never attain its full flavour, and it must not be forgotten that repeatedly disappointed consumers will tend towards a reduced consumption of fruit.

It is not always practicable, but where possible picking should be carried out before the fruit has been heated up by the sun. If it has to be picked in a hot condition it should be kept loose overnight in partially filled open cases, stacked in such a manner to allow the fruit to cool off before packing. A free leaflet on picking and marketing is obtainable from the Department, and also a large and well illustrated bulletin on the packing of fruit, price 10d., post free.

To turn out a good dried article, stone fruit must be of the right type or variety, and must be perfectly ripe before gathering. The last of the apricot crop in the early part of the month and the first of the peaches suitable for drying in the latter part will be the occasion of the chief drying operations during January. A bulletin dealing with drying may be obtained from the Department, price 10d., post free.

Though the apple crop, and to a somewhat lesser degreee the pear crop, will be short this season, it is hoped that some attention will be paid to export. An outlet is necessary for these fruits, and to work up an export trade and to get our fruit thoroughly known on the export markets, it is necessary to send shipments regularly every season.

It is likely, however, that the shipments will be smaller, and in that case it is an opportunity to see that the grading and packing is as nearly faultless as possible. Intending exporters of apples, pears, or grapes should not delay in securing space, and the necessary cases, trays, and other packing material.

The Commonwealth Export Regulations.

For the convenience of growers it may be well to set out the Commonwealth regulations governing the export of fruit beyond Australia. —

FRUIT (FRESH).

Packing.

154. 1. Apples or pears intended for export shall be packed in accordance with the following provisions :—

(*a*) The fruit shall be packed only in cases or trays of the following dimensions :—

Cases for Apples or Pears.

Description of Case.	Internal Measurements (inches).
Australian bushel	18 x 14¼ x 8⅔
Canadian bushel	20 x 10 x 11⅛
Flat bushel	26 x 14¼ x 6 (clear of divisions)
Canadian standard	18 x 10½ x 11½
Three-quarter flat bushel	24 x 11¾ x 6 (clear of divisions)
Australian half bushel	18 x 8⅔ x 7⅛
Half flat bushel	26 x 7⅛ x 6 (clear of divisions).

Trays for Pears.

Internal Measurements (inches).

18 x 3¼ x 14¼, or
18 x 2⅞ x 14¼, or
18 x 2½ x 14¼.

Provided that those dimensions may show a variation to the extent of not more than 10 per centum (that is, 5 per centum under or 5 per centum above) on the total cubic capacity of the case.

(*b*) The fruit shall be packed in clean, new cases constructed of well-seasoned softwood or hardwood that has been smoothly sawn or dressed in an approved manner, and, in the opinion of the collector, sufficiently strong to withstand such handling as is ordinarily incidental to transport to destinations beyond the Commonwealth.

Grade Standards.

154. 1A. Apples or pears intended for export shall comply with the following provisions : —

(*a*) The outer layers or shown surfaces of the apples or pears—whether described as "Special," "Standard," or "Plain"—shall be a true indication of the average grade of the contents of the case.

(*b*) Apples or pears described as "Special" shall consist of sound, clean, well-formed apples or pears of one size and one variety free from broken skins and from disease. Superficial blemishes caused by hailmarks, limb-rubs, and sprays shall not be allowed to a greater extent than 5 per centum (by number) of the total fruit in any case. The fruit shall not measure less than two and one-quarter inches in diameter, and shall be of good colour for the variety.

(c) Apples or pears described as "Standard" shall consist of sound, clean, well-formed apples or pears of one size and one variety, free from broken skins and from serious blemishes, but fruit slightly blemished by rubbing, black-spot, fungus, or caterpillars may be exported, provided that—
   - (i) the proportion of such fruit does not exceed 10 per centum (by number) of the apples or pears in any case,
   - (ii) no one of the four blemishes mentioned is found on more than 5 per centum (by number) of the apples or pears in any case, and
   - (iii) the total area covered by such blemishes on any apple or pear does not exceed the area contained in a circle having a diameter of one-quarter of an inch.

Russeting of the surface shall not be deemed to be a blemish if the skin is unbroken. The fruit shall be not less than two and one-quarter inches in diameter, except in the case of varieties, which, in the opinion of the collector, may be regarded as normally small, in which case the fruit shall be not less than two inches in diameter.

(*d*) Apples or pears described as "Plain" shall consist of apples or pears of one variety and one size, free from broken skins, and not seriously blemished or injured by any disease, but fruit slightly blemished by rubbing, black-spot, fungus or caterpillars may be exported provided that—
   - (i) the proportion of such fruit does not exceed thirty per centum (by number) of the apples or pears in any case.
   - (ii) no one of the four blemishes mentioned is found on more than ten per centum (by number) of the apples or pears in any case, and
   - (iii) the total area covered by such blemishes on any apple or pear does not exceed the area contained in a circle having a diameter of three eighths of an inch.

Russeting of the surface shall not be deemed to be a blemish if the skin is unbroken. In the case of apples the diameter shall be not less than two inches.

Cultivation.

During the harvesting of deciduous fruit there is naturally a strong inclination to neglect ultivation, but a determined effort should be made to keep this part of the work going.

It is important, not only for the development of the later maturing varieties, but also because, if the trees are starved of moisture, the formation of fruit buds for the ensuing year will be very meagre.

It is at such times that cultivators that will get the work through speedily are so necessary.

The cultivation should be continued in citrus orchards. It is also a good opportunity for the citrus grower to get any soiling done, provided the ground is dry enough to allow carting among the trees.

Pests.

These are also apt to be neglected during the harvest period, even by those who have put up a persistent fight earlier in the season. Such pests as peach aphis are done with and need no further action till next season; and as fruit approaches maturity it is sometimes impossible to deal with woolly aphis of the apple until the trees are cleared of fruit, but there should be no let-up with fruit-eating insects, such as codlin moth. All returned or second-hand cases should be dipped, either before or directly they come on to the orchard, and all infected or waste fruit regularly collected and boiled before there is any chance of the larvæ leaving the fruit to pupate and presently

return to the trees as the perfect insect to lay eggs there and thus perpetuate an ever-increasing trouble. Where bandages are used they should be examined regularly once a week and any harbouring grubs destroyed.

Weather conditions have not been favourable for black spot of the apple and pear, and it has been possible to dispense with the later applications of fungicides. There is now very little danger of a serious attack from this disease, but where later applications of Bordeaux mixture on grape vines have been omitted it would be well to give one in case of a late outbreak of downy mildew.

There are indications of an early development of red scale on citrus trees this season, and where this is the case and spraying is relied on it would be advisable to make an application of resin soda wash early, and then, if necessary, use the same spray again later to catch those which emerge later. It often occurs when these citrus scale start early that the development extends over a long period, and by the time the last young scale come out the earlier ones have developed sufficient covering to protect them from the effects of the spray. Where fumigation is employed the difficulty is overcome to a great extent as it is more effective on older scale than sprays.

Last season control measures against scale had to be delayed till very late because of the dry conditions in areas where irrigation was not possible. If rain does not fall soon some risk will have to be taken, as some defoliation caused by the treatment will be a lesser evil than the very weakening effect of a second year of bad infestation of scale.

All citrus trees should be watched when working among them, and any trees showing signs of attack by white louse should be marked for prompt attention. This pest can be effectively treated with full winter strength lime-sulphur without sufficient of the spray getting on the foliage to do harm provided the operation is carried out while the pest is only on the main stem or limbs. If the pest is allowed to spread to the twigs carrying the foliage, fumigation must be resorted to. Of course, where trees are to be fumigated within a month or two special treatment for louse is not necessary.

"ELEMENTARY LECTURES ON VETERINARY SCIENCE."

THIS book—by Henry Thompson, M.R.C.V.S., Lecturer on Veterinary Science at the Aspatria Agricultural College—has now been published for many years, and is found to have very considerable use among farmers and agricultural students. Many portions of it are of considerable value to both classes of readers, but it must not be expected that perusal of books of this nature will enable the farmer to make accurate and satisfactory diagnosis of the various complaints from which his live stock may suffer. To agricultural students, who have passed some more or less comprehensive course in elementary veterinary science, the book is of greater value.

Our copy from the publishers, Messrs. Bailliére, Tindall and Cox, London.—[illegible], Acting Chief Inspector of Stock.

Insect Pests of the Present Season.

W. B. GURNEY, F.E.S., Government Entomologist.

Grasshoppers.

In view of the prevalence of swarms of grasshoppers in certain districts last year, a warning in this connection is not out of place.

Normally the first hatch of grasshoppers from the eggs laid in March and April takes place in the following September and October. The season is late this year and a correspondingly later hatching usually follows. The hoppers become winged in November and December, and these winged swarms lay eggs which hatch in three weeks. The second hopper swarms appear during December, January, and February, and (becoming winged) are flying swarms during March and April. It is these second winged swarms which lay the eggs that remain unhatched until the next spring.

Egg-laying is effected by the swarms in comparatively limited patches of ground, varying from a few square yards up to thousands of square yards, according to the size of the swarm. The swarms when laying usually mass together for a day or two on some bare or thinly grassed lands, and deposit their eggs one or two inches below the surface. By noting the position of the egg-bed areas it is possible to kill the tiny young hoppers immediately they emerge, and before they grow and spread, by organised and systematic spraying. If this attack upon the patches of young hoppers be made within the first three weeks after they emerge from the ground, the majority of the hoppers will be killed before they do any appreciable damage, and the pest can thus be controlled.

Arsenite of soda in solution is the spray recommended. It is perfectly harmless to stock under ordinary field conditions. The formula recommended is :—Arsenite of soda, 1 lb.; treacle, 4 lb.; water, 16 gallons. An important point in mixing is to dissolve the arsenite of soda in a kerosene tin or more of hot water, and to dissolve the treacle in a separate quantity of hot water, allowing both mixtures to cool before bringing them together, when the whole can be made up to the 16 gallons.

The spray should be applied to a strip of grass about 30 feet wide around each swarm, as well as directly on to the hoppers themselves; it kills both by direct contact with the bodies of the grasshoppers and by poisoning the grass upon which they feed. The spray mixture can be carried to the swarms in petrol-tins, two in a case, with a hole in the top of each tin sufficiently big to admit the foot of the pump; a large number of tins can be carried on a spring-cart, from which the infested ground can be sprayed.

The spraying may be light, but it should be thorough, and the spray should be applied in a fine mist. For this purpose a small bucket pump, costing about £2 5s., will be found satisfactory. To treat 6 acres actually infested with hoppers 28 lb. of arsenite of soda and 1 cwt. of treacle will make a sufficient quantity.

A paris green bait has been used with success in America and elsewhere, but its practicability has yet to be proved under Australian conditions.

United action is essential for success in grasshopper control. It is a community problem, and should be taken up as such. The best results can be obtained only when every landowner is on the lookout for trouble and is prepared to combat it. Eleventh-hour measures are not so easily carried out nor are they so effective as those taken in ample time. The best time to destroy the grasshoppers is before they reach maturity, and particularly during the first two or three weeks after hatching. For this reason landowners should watch their fields for the appearance of the insects, and spray the hoppers while they are in the massed state.

The Rutherglen Bug.

Reports have already been received by the Department of Agriculture of the appearance of Rutherglen bug in a few isolated places, and farmers, gardeners, and orchardists should be on the look-out for this voracious insect. Under ordinary conditions the swarms generally appear in December and early in January, but the present season is somewhat late, and infestations may, therefore, be three or four weeks later than usual.

Rutherglen bug is one of the very worst native insect pests in New South Wales. It is widespread, it multiplies in great numbers in grass and weeds, and it is almost indiscriminate in its taste for cultivated crops. Potatoes, tomatoes, and almost any succulent vegetable attract it, but it also attacks fruit trees, clustering on the fruit to suck up the sap and damaging the crop to the extent of either making it unmarketable, or causing it to fall. It will be found illustrated on page 54,

Should these bugs appear in serious numbers, it may be necessary to spray with kerosene emulsion or a concentrated tobacco extract (nicotine sulphate) or with a mixture of both, or it may be practicable to draw a large dish of water and kerosene between the rows, beating the crop on both sides, so that the insects fall into it. An ordinary 9-foot sheet of iron with both ends and sides turned up suits the purpose quite well, and a gallon of water and a pint of kerosene are sufficient to complete the equipment.

In the case of fruit trees, the insecticides will kill the insects if applied thoroughly, but constant re-infestation by the bugs may necessitate daily spraying. To avoid this, good results have been obtained by dusting the trunk and main branches of the trees with lime after they have been sprayed or the bugs have been dislodged by shaking. The dusting with the lime, prevents the bugs from crawling up the trunk and re-infesting the fruit.

The most effective preventive of Rutherglen bug is clean cultivation throughout the l tter part of the winter and the spring. Grass and weeds along the edges of the cultivation afford this bug excellent shelter, in which it can hatch out and increase during the spring. The remedy, therefore, is to destroy all such shelter—in other words, to turn over all headlands and corners before the end of the winter, and keep the surroundings of the field and orchard free from all uncultivated growth. The cultivation kills many bugs in the young stages and deprives the rest of food. Even if neglected in the early part of the season, good can be done by cleaning up and burning off headlands after the presence of the pest has become apparent. Few farmers realise how important this practice is in relation to Rutherglen bug and a good many other pests.

Bad infestations occur every few years, the result of a series of conditions favourable to the increase of the insects, but the practice of clean cultivation would minimise the pest in the worst of years.

To Treat Lice Infestations from Starlings.

Inquiry was made by a correspondent recently as to a method of exterminating the lice remaining after the removal of a colony of starlings. The nests of the birds had been rooted out from under a box casing in the roof, but although disinfectants had been tried and sulphur used as a fumigant, and, despite the fact that the rooms were otherwise spotlessly clean, having recently been repainted and repapered, the household was still troubled with the tiniest black insects, the nippings of which raised large lumps.

The correspondent was informed that the nesting of starlings in houses had been reported several times during the season as causing infestations of lice. The first step necessary had already been taken in removing the nests. It was advisable to spray the woodwork and the inside of the floor of the loft with a mixture of one pint of phenol in eighty parts of water, care being taken not to apply so much that it would percolate down to the plaster ceiling. This mixture could also be used on the woodwork in the rooms below.

Fumigation of the rooms with sulphur, if thoroughly done, should be effective if a strong charge of 4 to 5 lb. to every 1,000 cubic feet of space were used. The sulphur should be placed in a metal vessel of such depth that it would not run over when burning, the vessel itself being placed for greater safety upon a sheet of iron. Metal objects should be removed from the rooms or they would be tarnished by the fumes; the brass knobs of bedsteads might be protected by smearing them with vaseline. The rooms should be kept closed for at least twelve hours.

The important thing, however, was to treat the woodwork with a suitable insecticide, such as the phenol solution mentioned or wood-preserving oil. If such insecticides were carefully and persistently applied, it might not be necessary to fumigate at all.—T. McCarthy, Assistant Entomologist.

Poultry Notes.

January.

JAMES HADLINGTON, Poultry Expert.

Out of the dark days of 1923, with its comparatively low prices for eggs and high cost of feeding, there has, if I mistake not, emerged a fact of the highest importance to the poultry industry.

This is, that eggs exported from this State have taken their place among the high-class eggs imported into Great Britain. The export of eggs from this State is not exactly a new venture, but the prices realised for our eggs this export season have been a new and important feature. Such prices as 2s. 4d. to 2s. 6d. per dozen in London place our eggs within reasonable comparison of those coming from Denmark. The latter country, owing to its close proximity to the home markets and the recognised high quality of its goods, has, to a large extent, set a standard for its varied products. Yet our dairy-farmers many years ago obtained a firm footing for their products in the same market. The significance of the above prices for our eggs is that the poultry-farmers of this State have now established a reputation that will enable them also to secure payable prices. When it is realised that the prices made mean a Sydney parity of 1s. 6d. to 1s. 8d. per dozen for eggs produced in the cheap season here, when eggs were making only 1s. 2d. to 1s. 3d. per dozen, the significance of the circumstance will be better understood.

This is in sharp contrast to last year's operations in exporting eggs. What, it might be asked, is responsible for the difference in the two years? There is no suggestion, so far as is known, of any abnormal factor in the market itself having acted to produce this result. The industrial position in England has been such that one would naturally anticipate a slow demand and rather lower than the average prices.

The Cause of Success.

What, then, has contributed to the successful marketing of our eggs in London? Undoubtedly the greatest factor has been the quality of the eggs landed there from this State. There is no disputing the fact that during the last three years much solid experience has been gained in the export of eggs—more perhaps than will ever appear in print—but the main things have been good eggs and superior packing. The export of eggs is not an entirely new feature; it has been done more or less for years by speculators and others, but probably never before has there been such an organised effort to place them on the other side of the world in such fine condition. Past experience of prices, therefore, even if known, has been no criterion of what is possible with Australian eggs. Now it is known, and in this knowledge the poultry-farmer has an asset that he scarcely realises the import of. Best of all, these results have been obtained very largely by the efforts of poultrymen themselves.

It is doubtful if the full significance of this season's export of eggs, consisting of only some 20,000 cases, will be fully realised by poultrymen for some time to come. But what should be realised is that with such a market, many times 20,000 cases would be as a drop in a bucket. If I am not mistaken it will be found that a link has been forged that will make our egg trade as stable, profitable, and secure as that of butter, cheese, meat, and other products in the London market. If this should prove to be the case poultry-farming will have entered upon a new phase.

The Best Ever.

Of three things there is no doubt. These 20,000 cases were the best eggs, the best graded, and the best packed that have yet left this State. The result is the best prices secured on an ordinary market. It can be accepted that previous seasons' shipments have been the preparation that has been destined to secure for our eggs the recognition now accorded them in London. Henceforth, eggs bearing the Sydney, N.S.W., brand, will be sought after for their quality. We must continue to do our part by sending only such quality and grade as will maintain the reputation lready gained. Many have been the doubts expressed that it was not possible to establish an export trade. If old conditions had prevailed this would have, in all probability, proved to be only too true.

It has also been urged that England was producing more eggs and therefore importing less. To some extent this is true, but it should be understood that this spurt of activity in egg-production in England was the outcome of war-time conditions, and to those who know something of English conditions it will appear very doubtful whether even the production already reached will be maintained. In any case, England will never produce anything like her own requirements. The essential facts are that the market is there—as in the case of our other products—and that we have met our keenest competitors and have come out at least holding our own. It must be remembered that we have some very substantial advantages in such competition. Our seasons are the reverse of nearly all our competitors, and our average egg-yield is (or should be) higher, because we have a more favourable climate, and few, if any, can have cheaper poultry foods on the whole.

True, we have distance to our disadvantage, but the greater part of the expense attached to the export of eggs is not entailed by distance, but by packing, grading, and general handling, the like of which must be done by any country exporting to the same market.

The Previous Season's Export.

In view of the almost disastrous results following upon the previous season's export of eggs, such an outlook as we have presented may seem unduly optimistic. But let us examine the factors.

Previous to the spring of 1920 the export of eggs had been in other hands. The shipments made by poultry-farmers in that year, under the auspices of a pool, were but small. An increased number was exported in 1921, with

something akin to fear as to results. In the spring of 1922, something of a splash was made and risks were taken—this is freely acknowledged.

In each of these seasons experience was being gained by poultry-farmers and their representatives, not only on the commercial side, but also as to economical grading, packing, and general handling. Better eggs went forward and at less cost for handling. A reputation was in the making on the other side of the world.

Previous to 1920 the poultry-farmer did not know what eggs were being exported, let alone the prices obtained for them. Yet eggs were being exported, though not by the farmer. If it were admitted that the farmer had paid a little to establish a reputation for his eggs in three years—as is now evidenced by the prices made—it is surely an achievement that he might pride himself upon.

The restricted number of cases sent this last season was the result of "playing safe." The experience has been valuable, and, after all, may have been cheap at the price. It is safe to say—as a matter of fact it is common knowledge—that other producers have paid much more dearly for the experience that has put their industries on a sound footing.

The future of poultry-farming was never more hopeful than at the commencement of 1924.

Cost of Production.

Notwithstanding the better outlook, or any other view that may be taken, cost of production is a prime factor to be taken into account. When it is realised that very close to 50 per cent. of the income from a poultry-farm is swallowed up in the cost of feeding, the items of the food bill become most important. The old axiom that a pound saved is a pound earned applies here. Yet many poultry-farmers who opine that their farms are not showing an adequate return are, by their methods of feeding, unduly increasing the cost of production. Every penny by which this cost is increased lowers their income by an equal amount.

In this connection economy in feeding should not necessarily consist in restricting the amount of food. That would be a losing kind of economy, unless, indeed, more is being fed than is necessary to satisfy the wants of the birds. Even cheap food of inferior quality might be dear to feed. This, also, would apply to where an abnormal amount of green feed is fed to take the place of more substantial fare.

However, probably the greatest increase in cost of feeding over and above the normal cost is due to faddy methods by which many hope to increase their production. There is no end to the things that might be tried, and in consequence the cost of production is often increased to an extent calculated to ruin every hope of successful operations.

The Department has from time to time published the ration upon which the birds in the egg-laying competitions at Hawkesbury Agricultural College are fed, and upon which not only high general averages of up to 206 have

been produced, but individual hens have put up as high records as 324. In this connection it might be pointed out that the ration is not the outcome of some bias in favour of feeding set articles of food without regard to other available materials and economy in the cost of feeding. A reasonable view to take of this ration is that if hens on it can put up such tallies as 17 dozen each, while the farmer feeding it is not securing a modest 12 dozen, the fault cannot be with the ration. The Department has for some years now been carrying out feeding experiments at the College, but has not so far discovered a better ration than the one that is being fed.

The lesson to be conveyed to the farmer is that when contemplating the introduction of some articles of diet that are more costly than those in use, remember an expensive ration may not produce more eggs. If it does not, then cost of production is correspondingly increased.

Control of Chicken Pox.

Last month reference was made in these notes to the control of chicken pox, and the use of vaccine. It may be well to add that as far as this season is concerned poultry-farmers will be well advised to stick to what protection is to be gained from the use of sulphur, as advocated in these notes in previous years. The method is to add 1 ounce of flowers of sulphur to every 7 lb. of mash every third day, over a period of three weeks. Then the sulphur should be stopped, and for the next three weeks Epsom salts should be added every third day to the drinking water at the rate of 1 ounce to the gallon. At the end of three weeks the Epsom salts should be stopped and a return be made to the flowers of sulphur in the mash. This alternating treatment should be continued until the period is passed during which the chicken-pox is seasonable. It is not necessary to treat second or third year birds, though it will not harm them as sulphur is rather beneficial during the moulting season, which is coincident with the chicken-pox season.

Doradillo Grapes Prohibited as Raisins.

At the conference of Ministers of Agriculture held in Melbourne last week, discussion centred round the practice, which exists in at least one State, of selling dried Doradillo grapes as raisins. It was pointed out that the Doradillo is essentially a spirit-producing grape, and cannot be compared with other varieties as a raisin grape. It was recognised that, as the quality of our raisins must be maintained at the highest level to command a sale, the Commonwealth authorities should be asked to prohibit the use of the word "raisin" for the dried product of the Doradillo.

The Minister for Agriculture (the Hon. F. A. Chaffey) has since received information that the Commonwealth authorities have drafted regulations under the Commerce (Trades Descriptions) Act providing that dried fruits produced from any variety of grape other than the Zante currant, sultana, Waltham Cross, and White Muscatel are describable as "dried grapes," and not as "raisins." If described as other than "dried grapes" the goods will be regarded as bearing a false trade description, and will accordingly be prohibited from export.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Dapto A. and H. Society	E. G. Coghlan	Jan. 18, 19
Kiama A. Society	G. A. Somerville	,, 25, 26
Gosford A. Association	H. G. Parry	,, 25, 26
Wollongong A. H. and I. Association	W. J. Cochrane	,, 31 to Feb. 2
Berry A. Association	G. Gillam	Feb. 6, 7
Tahmoor A. H. & I. Society	E. S. Key	,, 8, 9
Yanco Irrigation Area A. Society	W. Roseworn	,, 12, 13
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	,, 15, 16
Guyra P. A. and H. Association	P. N. Stevenson	,, 19, 20, 21
Alstonville A. Society	W. J. Dunnet	,, 20, 21
Pambula A. H. & P. Society	L. K. Longhurst	,, 20, 21
Tilba A.P. and H. Society	R. L. Hapgood	,, 20, 21
Nepean District A. H. and I. Society	C. H. Fulton	,, 21, 22, 23
Wyong District A. Association	L. C. Reeves	,, 22, 23
Candelo A. H. and D. F. Association	R. E. Johnson	,, 27, 28
Moruya A. and P. Society	H. P. Jeffery	,, 27, 28
Gunning P. A. & I. Society	G. E. Ardill	,, 27, 28
Robertson A. and H. Society	M. M. Westropp	,, 27, 28
Newcastle A. H. and I. Association	E. J. Dann	,, 26 to Mar. 1
Manning River A. and H. Association (Taree)	R. Plummer	Mar. 4, 5, 6
Tumut A. and P. Association	T. E. Wilkinson	,, 5, 6
Braidwood P. A. & H. Association	R. L. Irwin	,, 5, 6
Bellinger River A. Association (Bellingen)	J. F. Reynolds	,, 5, 6, 7
Yass P. and A. Association	E. A. Hickey	,, 5, 7
Oberon A. H. and P. Association	C. S. Chudleigh	,, 6, 7
Berrima A. H. and I. Society	W. Holt	,, 6, 7, 8
Central New England P. & A. Assoc. (Glen Innes)	Geo. A Priest	,, 11, 12, 13
Mudgee A. P. H. and I. Association	J. H. Shaw	,, 11, 12, 13
Dorrigo and Guy Fawkes A. Association	A. C. Newman	,, 12, 13
Warialda P. and A. Association	Lanagan Bros.	,, 12, 13
Hunter River A. and H. Society (West Maitland)	J. S. Hoskins	,, 12 to 15
Batlow A. Society	C. S. Gregory	,, 18, 19
Coonabarabran A. and P. Association	C. D Cox	,, 18, 19
Bowraville A. Association	C. H. Sullivan	,, 19, 20
Crookwell A. P. and H. Society	C. H. Levy	,, 20, 21
Goulburn A. P. and H. Society	F. D. Hay	,, 20, 21, 22
Lidcombe Agricultural Bureau	J. M. Macey	,, 22
Rydal A. H. and P. Society	S. Bruce Prior	,, 22
Blayney A. and P. Association	H. R. Woolley	,, 25, 26
Richmond River A. H. and P. Society (Casino)	P. M. Swanson	,, 25, 26, 27
Tamworth P. and A. Association	F. G. Callaghan	,, 25, 26, 27
Cooma P. and A. Association	C. J. Walmsley	,, 26, 27
Narrabri P. A. and H. Association	E. J. Kimmorley	,, 26, 27
Dungog A. and H. Association	W. H. Green	,, 26, 27, 28
Campbelltown A. Society	J. T. Deane	,, 28, 29
Cessnock A. Association	Bill Brown	,, 28, 29
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	April 2, 3, 4
Blacktown A. Society	J. McMurtrie	,, 4, 5
Camden A. H. & I. Society	G. V. Sidman	,, 4, 5
Orange A. and P. Association	Geo. L. Williams	,, 8, 9, 10
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10, 11
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 14 to 23
Hawkesbury District A. Association	H. S. Johnston	May 1, 2, 3

[Later dates noted, but held over.]

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Championship Field Wheat Competition in the Central South-west Districts.

[In 1923 the Royal Agricultural Society promoted a Championship Field Wheat Competition, and, with the approval of the Minister for Agriculture, Mr. H. C. Stening, Manager, Temora Experiment Farm, acted as judge. The following extracts from the report furnished to the President and Council of the Society by Mr. Stening will be found of interest to all wheat-growers.]

THERE were ten district societies entered for championship honours, viz., Barmedman, Boorowa, Cootamundra, Cowra, Eugowra, Grenfell, Illabo, Murrumburrah, Temora, and Wyalong. Of these societies only two conducted a competition the previous year, and it may be concluded that the awarding of championship prizes by the Royal Agricultural Society has resulted in a greatly increased number of local competitions, each in itself stimulating interest in a general improvement in farming methods.

In the division of the State covered by this competition, the rainfalls recorded during the fallow period were approximately 5 inches below average, while over-average rainfalls were registered during the growing period, with considerable variation in different districts; for instance, the effective rain for the period April to October varied from 13·45 inches at Wyalong to 23·20 inches at Cootamundra, the former representing 3·06 inches and the latter 8·37 inches above the average for the period. The chief over-average period was the winter period of June and July, when the registrations varied from 7·47 inches at Cowra to 12·99 inches at Cootamundra, representing 3·01 inches and 8·06 inches above average respectively. These excessive rains resulted in land in low-lying situations or in depressions becoming water-logged, a condition which is inimical to favourable growth and prolific stooling. Fortunately the situation was saved by a low rainfall in August, succeeded by good spring rains in September and October, as the result of which some very satisfactory yields will be returned.

The championship was won by a fine crop of College Purple grown by Mr. James Simpson, the winner of the Grenfell competition, on a loamy soil of slate derivation. The previous crop on this particular land was oats which had been cut for hay; the land was fallowed in the following August with mouldboard plough, and the only cultivation that the fallow received was a harrowing in March; 52 lb. graded seed and 45 lb. superphosphate per acre were drilled in the middle of April.

The crop was estimated to yield 35 bushels per acre; it was very even, true to type, and, considering that it was the sixteenth crop grown on the land, it was remarkably free from weed growth. A severe loss of points was sustained on the score of disease owing to the presence of bunt resulting from neglect to treat the seed, and also a little flag-smut; points were also lost for condition as there was a tendency for the heavy crop to "lodge."

Mr. M. Fogarty of Temora secured second prize with a very clean and even crop comprising Turvey and Bomen. It was the sixth crop, and was grown on fertile soil of alluvial formation which had been fallowed in June, disced in September, springtoothed in April, and sown early in May with 60 lb. per acre each of graded seed and superphosphate. The 50 acres of crop were estimated to average 33 bushels per acre; of the two varieties, Bomen was the heavier yielder, but it contained an admixture of another variety, this being responsible for a loss of points for purity. The Turvey crop was true to type, but was badly infected with flag-smut, thus emphasising the claim of flag-smut-resistance for Bomen, which, though growing alongside, was practically free from the disease.

The third prize went to the Cowra district for a crop of Hard Federation grown by Mr. J. Y. Freebairn on land well fallowed and sown in the middle of May with 60 lb. graded seed and 50 lb. superphosphate per acre. The growing crop was harrowed and was scrupulously free from weeds, scoring maximum points for cleanliness. Bunt and flag-smut were present and the crop was inclined to become tangled.

The total points scored by the crops at Murrumburrah and Illabo were separated by only one point from the third prize-winner, and the Barmedman crop was only two points behind, indicating the closeness of the competition.

Lessons from the Fallows.

The whole of the crops judged were grown on fallowed land with the exception of the Eugowra crop, which was grown under exceptionally favourable conditions on the banks of the Mendadgery Creek. The storage and conservation of moisture in the soil is generally regarded as the main object of fallowing, but in view of the substantial, and in some districts the excessive rains received during the crop-growing period, it is hardly likely that the conserved moisture alone was responsible for the distinction won by these crops in the local competitions. During the season other benefits of fallowing have asserted themselves, the chief of which is the increased production of nitrates that results, the conditions provided by fallowing being favourable for the development of soil bacteria which convert organic matter into nitrates. An increased supply of nitrates is especially an advantage in such a wet season. Another benefit was that the land was in a condition to be sown at the normal sowing period. Owing to the lack of rains during the autumn, unfallowed land was too dry and hard for ploughing until May or June, and seeding operations were further hindered by the heavy winter rains which commenced to fall early in June; consequently unfallowed land which it was the intention to sow, was either not sown at all or sown under boggy conditions in July or August with scant hope of success. It is very questionable whether the late sowing practice adopted in the Wimmera districts of Victoria is applicable to conditions in this State; it is the general experience, supported by the results of experiments, that it is only in exceptional seasons

DETAILS of Awards.

Name and Address of Competitor.	Local Society.*	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per acre.	Number of Crop.	Points Awarded. Apparent Yield.*	Trueness to Type and Purity. Maximum 20.	Freedom from Disease. Maximum 20.	Evenness. Maximum 20.	Cleanliness.†	Condition and Appearance.‡	Total Points.
1. Jas. Simpson, "Weerona," Grenfell.	Grenfell ..	College Purple ..	Fallowed 5 inches deep August, harrowed March.	Mid-April	lb. 52	lb. 45	16th ..	35	19½	14	19½	29	25	142
2. M. Fogarty, "Walladilly," Temora. ...	Temora ...	Turvey, 28 acres; Bomen, 22 acres.	Fallowed 5 inches deep June, disced September, springtoothed April	Early May	60	60	6th .	33	17	17½	19	28	25	139½
3. J. Y. Freebairn, "Inglebrae," Wattamondara.	Cowra .	Hard Federation	Fallowed 5 inches deep September, disced October and February, harrowed prior to sowing, crop harrowed.	Mid-May.	60	50	8th .	30	18	15	19	30	25	137
4. Hobson Bros., "Glenlea," Cunningar.	Murrumburrah	Waratah, 25 acres, Marshall's No. 3, 25 acres.	Fallowed 5 inches deep late August, harrowed twice in October, springtoothed February and before sowing.	Mid-May	60	56	20th	30	20	16	18	27	25	136
5. G. C. Jowett, "Killara," Cooba Creek, *via* Junee.	Illabo ...	Yandilla King ...	Fallowed 4 inches deep July-August, harrowed September, disced April, harrowed after drilling	Early May.	60	45	7th .	25	19	18	18	29	27	136
6. J. E. B. Jasprizza, "Gilmore Hill," Barmedman.	Barmedman ..	Federation ...	Fallowed 4 inches deep end July, springtoothed first week in October and first week in February.	First week in May	60	45	Over 6	34	15	15	18	26	27	135
7. F. C. Roberts, "Hillside," Jindalee.	Cootamundra	College Purple, 40 acres; Hard Federation, 10 acres.	Fallowed 5 inches deep August, disced February, harrowed before sowing.	First week in May	60	30	Over 6	33	16	14	18	26	25	132
8. Carman Bros., "Bowglen," Eugowra.	Eugowra ...	Canberra .	Disc-cultivated May, springtoothed before sowing	First week in June	60	Nil.	Over 6	24	20	17	19	24	26	130
9. H. and M. Curwen Walker, "Oakleigh," Wyalong.	Wyalong ..	Canberra, 27 acres; Federation, 23 acres.	Fallowed 3 inches deep August, springtoothed October and December.	Mid-May	45§ 60‖	40	1st ..	25	19½	18	18	24	24	128½
10. W. Thompson, "Lynvale," Boorowa.	Boorowa ..	Hard Federation, 24 acres; Canberra, 15 acres; Bungowanna, 11 acres.	Fallowed 5 to 6 inches deep September and December springtoothed March.	End April	60	60	Over 6	21	16	15	17	24	26	119

* One point for each bushel of apparent yield. † First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.
‡ First or second crop, 24 points; third or fourth, 25; fifth or sixth, 26; over six crops, 28 points. § Federation. ‖ Canberra.

favoured with a mild winter and a cool wet spring that the yields of late-sown crops exceed those of crops sown during the normal sowing period, that is, from mid-April to the end of May, in the major portion of our wheat areas. In early districts the period should be a little earlier, and in late districts a little later. than that mentioned.

It is interesting to note that most of the crops eligible to compete for the championship were sown from mid-April to mid-May with 60 lb. seed and 45 to 60 lb. superphosphate per acre. The results of experiments indicate that an increase of the quantity of superphosphate to 70 lb. per acre will return a profitable increased yield in most of the southern districts of the State. With later sowings increased quantities of both seed and superphosphate are a necessary corollary.

The Varieties.

Most of the standard wheat varieties were represented in the competition. Good rains at the end of October and early in November were favourable to the late-maturing varieties, which it is anticipated will considerably outyield the early-maturing varieties. College Purple has demonstrated its value as a yielder of grain as well as hay. Turvey possesses a rather open head and should be more suitable for hay than grain. Take-all detracted from a very heavy yield promised by the only exhibit of Waratah. It is very doubtful, however, if any of the above will supplant, under average conditions, such proved varieties as Yandilla King, Federation, and Canberra sown in the order mentioned.

The Toll of Disease.

The season apparently was a favourable one for the development of fungus diseases, for bunt, take-all, and flag-smut were prevalent in the crops. These diseases are making great inroads into our wheat crops and it behoves farmers to use every possible means to check them Six of the ten competing crops were infected with bunt; in two cases the seed was sown on a dry seed-bed without being pickled. Many farmers hold the opinion that seed sown on a dry seed-bed will not take bunt, and that bluestoned seed will be damaged by mould if sown under such conditions. This assumption has been falsified in previous seasons with dry sowing periods, and the experience of this season should again emphasise that one takes a great risk of smutty crops by sowing seed that has not been pickled Provided the bluestoned seed is dried thoroughly before sowing there should be no fear of the seed being destroyed by mould, the chief cause of which is sowing too deep on a dry seed-bed.

In the other four bunted crops in which the seed was reported to have been treated with bluestone solution, either the seed was not sufficiently treated, or more probably reinfection of the treated seed took place before sowing. Once bunt makes its appearance on a farm the spores are spread through implements, buildings, &c., and it is not a very easy matter to prevent reinfection of treated seed Experiments with the new treatment of seed

with dry copper carbonate indicate that not only are the bunt spores destroyed, but reinfection of the seed is prevented and a more satisfactory germination of the seed results.

Take-all was responsible for the exaction of a very heavy toll from the crops in the easternmost districts of the territory covered by the competition. Dry working of the soil, especially in the autumn, is undoubtedly congenial to the development of this disease, and the serious inroads made by this fungus were due chiefly to the fact that it was necessary to cultivate in preparation of a seed-bed, and to sow under dry soil conditions. In addition to treating badly infected paddocks with a good stubble burn, they should be spelled from wheat for at least two years, preferably by sowing a crop of oats the first year and by clean fallowing the subsequent year. This treatment is also an effective measure in the control of flag-smut, which caused a material reduction of yield of several of the crops judged. Recent researches have shown that the spores of flag-smut do not readily germinate in the soil, and investigations appear to indicate that if a crop is growing on the soil germination of the spores is stimulated. If fields tests should prove this fact to be correct it should be an incentive to a more general adoption of mixed farming, combining sheep with wheat, in which the growing of fodder crops to be grazed by sheep should take a prominent place. The present satisfactory prices for wool and fat lambs, and the comparatively low price of wheat, would indicate that the combination of wheat and sheep will be a more profitable proposition than wheat alone, and the carrying capacity of the farm will be greatly increased by the growing of fodder crops, such as oats and rape, to be sown in early autumn, grazed with sheep during the winter months, and the plant residues ploughed under before the crop runs to seed. If for no other reason than the maintenance of the fertility of our wheat paddocks, such a rotation of crops is distinctly of advantage. Our present system of fallowing, it must be remembered, adds nothing to the soil, but, on the other hand, is exhaustive of humus, and the ploughing down of the plant residues and sheep droppings after the fodder crops have been grazed is the best means of restoring humus to the soil.

A Case for Rotation.

"Last year I had a plot of potatoes which contracted Irish blight. This year I propose planting tomatoes in the same plot, and I would be glad to know if you think it advisable. I understand tomatoes are subject to blight, and have thought that the disease might still be in the ground."

It was pointed out in reply to the foregoing inquiry that, while it does not follow that because a crop of potatoes has been infected with Irish blight the succeeding crop will also be affected, to follow potatoes with tomatoes is not good garden practice. The potato and tomato are botanically related and are affected by many of the same diseases. It was, therefore, suggested that another site be utilised for the growing of the tomato crop.—A. J Pinn, Special Agricultural Instructor.

The Control of Take-all and Foot-rot in Wheat.

H. BARTLETT, Senior Agricultural Instructor.

OF late years, and particularly in the past season, there has been a marked increase in the occurrence of the wheat diseases, take-all and foot-rot, and their control is of great interest and of much moment to wheat-growers.

The life histories of the two fungi have been detailed in previous issues of the *Agricultural Gazette*, and control measures have been suggested, but the practical results obtained by a farmer after adopting the suggestions made by the Department of Agriculture will be interesting.

Mr. W. Ash, of Driftwater, Forbes, who is a soldier settler in the Grawlin Soldier Settlement (land that was formerly used only for grazing), and who has a heavy dark type of soil, merging in places into gilgais, sowed a paddock of 112 acres to wheat in 1920—the good year, when ten-bag crops were common throughout the district. In patches the crop stripped ten bags, but there were large faces and tongues penetrating into the crop which produced practically nil. Infected plants with their roots were forwarded to the Department of Agriculture for examination, and even though the country was new wheat land, the trouble was determined to be take-all and foot-rot. The paddock stripped 5½ bags per acre.

Mr. Ash decided to put the Department on trial, and he marked the paddock into two portions, A comprising 75 acres, and B 37 acres. The wheat stubble was burnt in March 1921, and the whole of the paddock was ploughed and harrowed the same month.

On portion A oats were sown in April, and were stripped, and the stubble burnt in February, 1922.

Portion B was not sown in the autumn of 1921, but it was harrowed twice prior to February, 1922.

The whole of the paddock, 112 acres, was spring-tooth cultivated in April, 1922, ploughed in June, harrowed in August, spring-toothed and harrowed in January, 1923, and sown early in April with 60 lb. of graded and pickled Federation wheat, and 45 lb. superphosphate per acre.

After two inspections—one in September, 1923, and the other in November, the result may be termed most successful. Only a few isolated plants were diseased, such as are found in most crops. For all practical purposes, the land was free from the diseases. The crop was undoubtedly the best within miles of this centre, and was estimated to strip eight bags per acre. The portion which received two years fallow and nine workings produced somewhat the better crop, but both systems were most effective in controlling the diseases.

Mr. Ash is of opinion that the Department of Agriculture has been tried and it has not been found wanting.

Wheat Experiment Plots in the Drier Areas.

L. S. HARRISON, Chief Inspector, Grain Elevator Branch.*

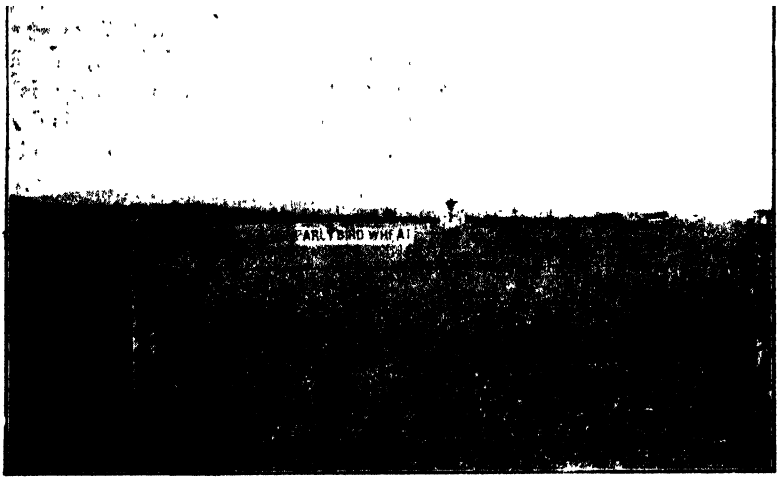
THIS season, for the first time, experiment plots were sown with Mr. G. C. P. Circuitt on Wabba, via Lake Cargelligo, situated about 17 miles in a south-westerly direction from the lake on the road to Hillston, and about 12 miles west in a straight line from Monia Gap. The country is of a most taking appearance, being typical of large areas situated in this district. The soil is a dark red loam, light in texture, and rather deep to sub-soil; the timber is mostly pine and wilga, with some box and belar; the country under mention is situated on a low rainfall area, being on the edge of the 13¾-inch average yearly rainfall, and outside what is so far recognised as the wheat belt.

Sowing the Plots.

The customary reservation must, of course, be made as to the acceptance of results of any one year's experiment, especially a year such as the past, with a rainfall well over the average. As against this, however, the condition of the soil must be considered, for it left room for improvement, since, owing to the size of the paddock in which the plots were situated and the absence of water, sheep could not be kept on the fallow. This, coupled with the necessity of using implements to combat weeds, affected the consolidation of the soil and rendered the surface rather too fine. It appears, however, that, with the use of sheep and judicious selection of implements, this country is capable of being brought to a very satisfactory condition.

* Formerly Senior Agricultural Instructor, Southern District.

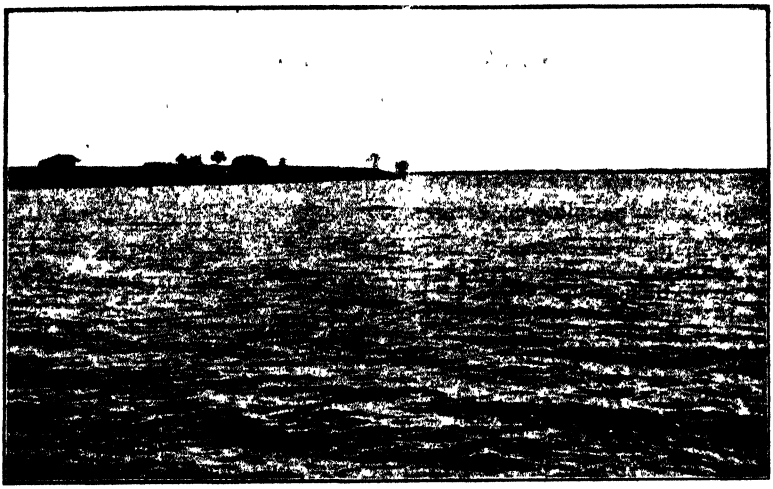
The rainfall was 930 points on the fallow from July, 1922, to May, 1923, and, after sowing, 1,268 points until November, 1923. Of the 1,268 points, 850 points fell in June and July. The land was fallowed in June, harrowed in December and January, disced in March, harrowed in April, and sown in ¾-acre blocks on 4th and 5th May, 1923. The seed was sown at the rate of 50 lb. to the acre, and superphosphate at 42 lb. to the acre in the variety trials.



Portion of the Experiment Plots.

The Adjoining Paddock in September.

Harvesting was completed on 27th November, Early Bird, Improved Steinwedel, and in a lesser degree Gresley, suffered from shelling. The last-named variety germinated badly in the first place, the seed suffering apparently from pickling injury. As against the low yield of Early Bird,



A view of Lake Cargelligo.

the fact must be noted that it could have been cut for hay in the last week of September, it being then 4 feet high. It is reasonable to assume, owing to the climatic conditions, that the grain grown in this locality will be of excellent milling quality. The results are as follows:—

	bus.	lb.
Federation (70 lb. superphosphate to acre)	20	49
,, (56 lb. ,, ,,)	23	0
,, (42 lb. ,, ,,)	22	37
Major	22	31
Canberra	19	43
Hard Federation	19	29
Waratah	19	14
Gresley	17	9
Improved Steinwedel	16	16
Early Bird	12	47

Bomen and Warden were also included and yielded respectively 20 bus. 53 lb. and 19 bus. 43 lb. per acre, but they are shown separately, as owing to the exclusion of red wheats from the f.a.q. sample their growth is being discouraged by the Department.

Spare Copies of the *Veterinary Journal*.

A number of duplicate parts of the *Veterinary Journal* are on hand at the Stock Branch of the Department. Any person who would like to complete a file of the *Journal* from these duplicates might communicate with the Acting Chief Inspector of Stock, stating what numbers he requires. Applications, which should be addressed to the Acting Chief Inspector of Stock, 56 Bridge-street, Sydney, will be taken in the order of their arrival.

Farmers' Experiment Plots.

Winter Green Fodder Experiments, 1923.

Upper North Coast.

E. S. CLAYTON, Agricultural Instructor.

WINTER fodder experiments with wheat, oats, barley, and rye, were conducted last season with the following farmers :—

E. Amps, "Goldsbrough," Camira Creek.
E. Green, "The Risk," Kyogle.
R. W. Hindmarsh, "Wiaraga," Bellingen.
H. Johnson, Condong, Tweed River.
J. D. Kirby, "Ashton Farm," Shark Creek, Maclean.
M. McBaron, "Riverview," Raleigh.
C. Oliver, "Laureldale," Casino.
H. Short, "Warrawee," Dorrigo.

The weather conditions throughout the season were very unsatisfactory; dry weather delayed the planting in most cases, and the plots at Shark Creek were flooded when the crops were about 9 inches high, the water remaining on the land for some time. The adverse weather conditions experienced at many localities resulted in low yields, and comparable results were not obtained at Raleigh, Shark Creek, and Dorrigo.

The following table shows the effective rainfall at the various centres :—

Month.	Kyogle.	Condong	Casino.	Camira Creek.	Bellingen.
	Points.	Points.	Points.	Points.	Points.
April		1,926	......	......	......
May	5	36	......	......	8
June	144	249	150	50	155
July	181	132	170	70	446
August	158	413	140	41	333
September	70	......	60	21	149
Total	558	2,756	520	182	1,091

The Plots.

Camira Creek.—Poor sandy soil with heavy clay subsoil. Superphosphate was applied to each variety at the rate of 1 cwt. per acre. It is futile to attempt to grow crops at this centre without using fertilisers, but when even small quantities of fertiliser are applied, very fair crops are obtained. Considering the low rainfall recorded it is surprising that these plots made any growth at all.

Kyogle.—Soil, alluvial loam. The land was well prepared, and the crop was sown on 3rd May. Although the rainfall was low for this locality (only 5½ inches being recorded), very fair crops were obtained. The Skinless barley and Florence wheat plots were harvested on 9th September; all other varieties on 23rd September, excepting the Algerian oats, which were cut on 11th October.

Condong.—Soil, alluvial loam; situated on the banks of the Tweed River. The plot was sown on 5th May, and most of the varieties were ready to harvest in September. The rainfall was very heavy, over 27 inches being recorded during the growing period. Very little rust, however, was noticeable, the only variety suffering in this respect being Skinless barley.

Bellingen.—Soil, alluvial loam; the crop was sown on 18th May. Sunrise, Algerian, and Ruakura oats gave the heaviest yields. Among the wheats, Zealand and Warden gave the best results.

Sunrise Oats at Kyogle.
The crop yielded 15 tons to the acre.

Casino.—Heavy black volcanic soil. Crop planted 8th May, and harvested in September and October. Field peas grow well at this centre, but vetches have never given good results. Both varieties of barley failed, and the late-maturing varieties of wheat and oats made very little growth. The rainfall was low, only 5 inches being received.

Shark Creek.—Soil, heavy alluvial loam. The plots at this centre germinated excellently, but unfortunately were completely flooded when the crop was about 9 inches high. The water remained on the land for some time, and the crop was destroyed.

Dorrigo.—Soil, red volcanic loam, which is very light and friable to a considerable depth, and which dries out rapidly. Comparable results were not obtained at this centre on account of the exceptionally dry and cold weather which prevailed.

YIELDS of Green Fodder.

Variety.	Kyogle.	Condong.	Casino.	Bellingen.	Camira Creek.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Florence wheat and Golden vetches	12 6 1	10 14 1	5 3 0	9 16 2	......
Florence wheat and Grey field peas	......	10 12 1	6 0 0	7 5 1	4 4 2
Florence wheat	10 8 1	10 0 0	6 9 2	6 0 0	4 15 3
Firbank wheat	9 2 0	9 16 2	5 0 0	6 0 0	4 4 0
Zealand wheat	...	10 16 2	4 0 0	12 17 2	4 2 1
Hard Federation wheat	6 14 2	...	......	......	......
Clarendon wheat	......	10 7 0	4 5 1	6 4 1	4 0 0
Warren wheat	......	......	......	4 5 2	......
Cape barley	13 3 1	12 13 3	Failed	10 19 1	......
Skinless barley	10 8 1	7 6 0	Failed	7 2 0	......
Sunrise oats	15 0 0	10 15 2	5 0 0	15 10 0	5 0 0
Mulga oats	12 0 0	......	......	......	......
Guyra oats	......	......	......	......	4 1 0
Algerian oats	10 0 0	10 4 2	4 1 2	15 0 0	2 5 1
Ruakura oats	......	10 17 1	3 2 0	15 10 0	4 13 2
Black Winter rye	......	......	......	......	2 2 3
Slav rye	......	......	......	......	2 0 0

YIELDS of Fertiliser Trials.

Fertiliser.	Kyogle.	Condong.	Casino	Bellingen.	Camira Creek.
	Florence Wheat and Golden Vetches	Florence Wheat and Grey Peas.	Florence Wheat and Grey Peas.	Florence Wheat and Grey Peas.	Florence Wheat and Grey Peas.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Superphosphate 280 lb. per acre	12 18 3	10 12 1	8 3 1	8 0 0	5 3 1
Superphosphate 140 lb. per acre	12 15 3	10 7 0	6 18 0	8 0 0	4 5 0
*M7 182 lb. per acre	13 3 2	9 12 3	6 9 2	6 0 0	5 2 0
*M5 210 lb. per acre	13 4 1	10 15 2	6 5 3	7 5 1	4 4 0
*P7 126 lb. per acre	12 6 1	10 13 0	6 9 2	6 15 2	3 18 0
No manure	12 6 1	10 12 1	6 0 0	7 5 1	1 10 0

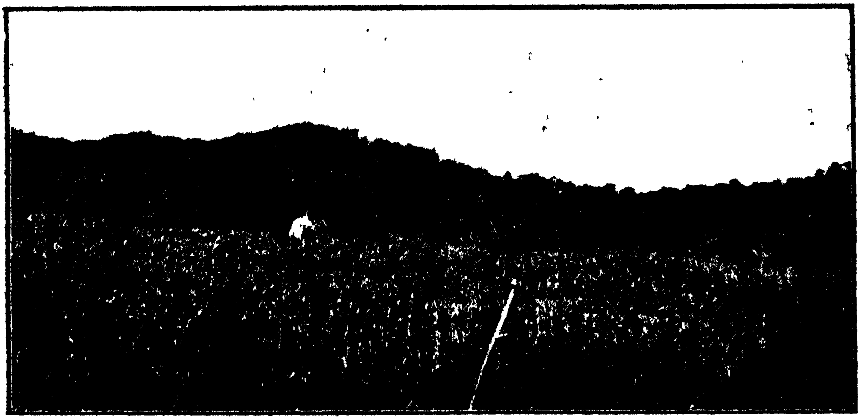
*M7 mixture consists of ten parts superphosphate and three parts chloride of potash; M5 of two parts superphosphate and one part sulphate of ammonia; P7 of equal parts of superphosphate and bonedust.

Rate of Seeding Trial.

With the intention of ascertaining the most profitable amount of wheat to sow with field peas for green fodder, a trial was conducted on Mr. E. Green's property at Kyogle. The trial was carried out on rich alluvial soil, and the result was as follows :—

	t.	c.	q.
Florence wheat ½ bushel, and Grey field peas ½ bushel per acre ...	12	6	1
" 1 " " ½ " ...	11	12	0
" 1½ " " ½ " ...	11	5	2
" 2 " " ½ " ...	10	12	3

The yields obtained in this experiment substantiate the results obtained previously in this district on both rich and inferior land, namely, that a small quantity of wheat sown with ½ bushel of Grey field peas gives the highest yield.



The plot of Florence Wheat at Kyogle.

Comment.

On the Upper North Coast, fodder crops of wheat, oats, and barley are particularly useful for spring and early summer feeding. It is not so necessary in this district to plant the crops early to provide feed in the winter Saccaline is more suitable as the yield is usually heavier, and in this district with its mild winters, succulence is retained. It is in the spring and early summer, rather than during winter, that feed is particularly scarce in this district, and it is at this time that the cereals mentioned above are of great assistance.

In addition to growing sufficient green fodder for their needs, many of the more progressive dairy-farmers are conserving a quantity of hay for future use. It is a practice that can be highly commended.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

THE following farmers co-operated with the Department in conducting winter green fodder experiments :—

J. Chittick, Kangaroo Valley.
J. R. Knapp, Bolong.
C. T. Hindmarsh, Gerringong.
L. B. Garrad, Milton.
J. A. Martin, Pambula.
J. Timbs, Albion Park.
Superintendent, Boys' Farm Home, Mittagong.

The objects of the work were (1) to determine the suitability of different varieties of wheat, oats or barley to the different districts; (2) to test different quantities of seed per acre in sowing wheat and peas; and (3) to test the effect of artificial manure on the crops.

The weather conditions were not favourable at the time of sowing, and after the crops had germinated the weather kept very dry, especially in the far South Coast. The dry autumn was responsible for the late sowing in most cases. The earliest-sown plot was at Albion Park (22nd March), and the last at Pambula (21st June). The first crop ready to cut was Trabut barley at Gerringong, which was harvested 2nd August, having been sown 5th April.

Unless sowing can be arranged from the middle of March to the middle of April there is little chance of securing green fodder in July and August, when the pastures are off and foodstuffs generally short, and the best practice to ensure sowing at the time mentioned is to prepare the ground in January or February by ploughing and harrowing, and again working prior to planting; this leaves the ground in good order for planting and conserves moisture.

There was little to choose between the varieties on trial. Florence and Firbank are well known and are suitable for green fodder under coastal conditions; Bomen is also suitable, but it is doubtful if seed of this wheat will be available in the future.

As to the oat varieties, Ruakura rusted badly in some parts and will have to give way in favour of other sorts. Sunrise still rapidly outgrows all other varieties and gives excellent returns where greenstuff is so badly needed. There is no doubt large areas of Sunrise will be sown this season as seed will be available in large quantities; this oat will soon displace Algerian.

In the barley section Trabut has shown itself a faster grower than Cape, and capable, under good farming, of producing excellent returns, as at Gerringong. Large supplies of seed of this variety will be required when this barley is better known.

The experiment in which Florence wheat, in quantities from half a bushel to 2 bushels per acre, was sown with field peas at the rate of 30 lb. per acre is interesting, as it showed in several cases that the lightest sowing gave the best

results. The only plot drilled in was at Bolong; all the others were broadcasted. The plot at Gerringong was very fine; the portion sown at half bushel per acre there was easily the best. It is necessary, however, to carry on these seeding trials further, especially where crops are broadcasted.

The manurial trials emphasised facts that have been demonstrated by previous experiments, namely—

1. That it pays to manure, as not only is the benefit reflected in the weight per acre, but the manure hastens the development of the plant.
2. That superphosphate by itself is a very satisfactory manure.
3. That, especially where the manure is broadcasted, about 2 cwt. per acre is required.

It is surprising to find so many farmers who do not use artificial manure on land that would respond so readily to it. Those who have not yet tried it would be well advised to do so in the coming season.

Yields from Wheat Variety Trials.

Variety.	Kangaroo Valley.	Bolong.	Gerringong.	Milton.	Pambula.	Albion Park.	Mittagong.
	t. c. q. lb	t. c q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Florence	5 18 2 8	7 7 2 24	9 1 1 20	6 2 0 16	7 7 0 16	3 2 3 2	6 7 0 16
Firbank	3 11 1 14	6 18 1 4	9 0 0 0	6 8 2 8	7 10 0 0	1 4 0 12	6 11 1 20
Bomen	3 15 0 10	8 6 1 26	12 8 2 8	7 6 1 0	12 5 1 12	3 6 0 8	4 7 0 16
Oat Variety Trials.							
Algerian	8 6 0 14	18 12 2 0	12 17 0 16	19 3 0 4	13 10 0 0	1 19 2 16	4 1 1 20
Guyra	7 2 0 20	11 6 1 4	9 14 1 4	13 8 0 14	14 1 1 20	1 4 0 12	3 14 3 8
Ruakura	5 2 3 10	9 17 2 12	8 17 0 16	15 3 3 0	12 18 2 8	1 6 1 20	5 0 0 0
Sunrise	7 18 0 21	12 2 0 0	13 2 3 12	14 17 1 8	14 14 1 4	3 6 0 8	5 12 3 12
Barley Variety Trials.							
Trabut	5 1 3 0	9 18 0 0	17 8 2 8	10 8 3 24	10 2 3 12	3 12 2 20	2 4 1 0
Cape	4 18 0 15	9 18 0 0	13 10 1 12	9 4 3 8	12 14 1 4	4 5 3 14	1 11 1 24
Seeding Experiments with Florence Wheat and Field Peas.							
½ bus. wheat per acre	6 18 0 23	5 3 2 24	11 14 1 4	2 11 1 20	7 7 0 16	6 0 0 0	....
1 " " .	6 6 1 26	5 19 1 20	9 14 1 4	6 18 0 24	9 14 1 4	4 7 3 2	....
1½ " " ...	7 18 0 20	5 19 1 20	9 17 0 16	4 19 2 16	10 2 3 12	4 19 0 12	....
2 " " ...	4 18 0 15	6 2 1 26	10 0 0 0	4 5 0 20	9 18 1 25	5 5 2 24	....

Yields from Wheat Manurial Trials.

Manure per acre.	Kangaroo Valley.	Bolong.*	Gerringong.	Milton.	Pambula.	Albion Park.	Mittagong.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
P7, 130 lb.	7 10 0 24	6 2 1 26	4 14 1 4	4 5 0 20	6 2 2 0	2 9 3 8	5 12 3 12
M5, 210 lb.	6 18 0 21	5 3 2 24	5 14 1 4	5 2 3 12	8 0 0 0	2 6 1 18	6 0 0 0
M7, 190 lb.	5 2 3 10	5 10 0 0	5 2 3 8	3 15 2 4	5 12 2 0	2 6 1 8	5 11 1 20
No Manure	4 6 3 20	5 6 3 12	6 8 2 8	3 4 1 4	5 7 0 16	1 15 2 16	4 11 1 20
Superphosphate, 1 cwt.	9 16 3 14	6 5 2 24	6 14 1 4	3 7 2 0	7 4 1 4†	2 3 0 28	4 12 3 12
Superphosphate, 2 cwt.	6 6 1 26	5 6 3 12	7 0 0 0	4 18 0 4	6 18 2 8‡	4 17 2 12	6 7 0 16

* This plot was drilled in; amounts of manure slightly under the weights mentioned.

† Superphosphate applied at rate of 140 lb. per acre.

‡ Superphosphate applied at rate of 182 lb. per acre.

Murrumbidgee Irrigation Areas.

E. B. FURBY, Agricultural Instructor.

TRIALS with winter green fodder were sown by the following settlers on the Murrumbidgee Irrigation Areas, Griffith :—

W. H. Wood, Farm 417, Yenda.
S. H. Kelly, Farm 529, Yenda.
H. V. Murphy, Farm 128, Griffith.

The local dairy-farmer has many problems to face, the worst of which, in his opinion, and the one which entails the most anxiety, is the production of ample quantities of winter fodder. In the absence of abundant natural herbage, or that "something" which can be grown without any bother (a thing which we have not yet found), attention is necessarily directed to those well-known crops which have been grown for years past and which will continue to be grown in the years to come. The question is, therefore, not so much what to grow, as how to get the maximum out of that which can be grown.

These trials aim at finding out something in that direction. They are, nevertheless, subject to those influences which beset every settler. Two of the trials were rendered valueless by excessive flooding during the winter, while the third, slightly more favourably situated, was also partially damaged. It is admitted, however, that much of this damage might have been avoided by earlier planting and by having the crop fairly well grown by the time the rain started. On account of the severity of the winter and the consequent poor growth of other crops, it was found necessary to permit grazing of the plots before a good growth had been made. Winters will occur again similar to that just past, and if the lessons of this winter are thoroughly grasped, better provision will be made by dairymen for storing fodder and hand feeding, thus avoiding any danger of shortage during the winter months. For, after all, winter grazing of crops is not entirely satisfactory and should only be practised as a supplementary recourse to hand feeding.

The preparation of the land for winter fodders, as for the hay crops, is usually left until the last moment, whereas the ground should be fallowed and followed up by very efficient working. On Farm 417 a short fallow of four weeks, following on a 5-inch ploughing with the disc plough, proved ample to put the ground in good order. Without further working the soil was watered towards the end of March and cultivated twice with the springtooth cultivator, which left it in an almost ideal condition for sowing seed.

The importance of thoroughly irrigating every part of the paddock cannot be over emphasised. Too often one sees crops that are well grown, but on portion of the paddock only, which in many cases will reduce the yield by

more than half. The ideal can only be achieved by having the ground fairly well graded, the ditches clean and effective, and by proper utilisation of check banks to control the water.

Treatment of Plot, and Yields.

The soil on which this plot (Farm 417) was sown was heavy, red clay loam (typical of a large area in the dairying district), which by good cultivation is capable of producing very heavy crops.

Sowing was done on 20th April, 1923, with wheat and barley at the rate of 1 bushel per acre, and oats at 1½ bushels per acre. Where vetches were sown 30 lb. per acre were used. Superphosphate was also applied at the rate of 60 lb. per acre, and should never be omitted where crops have been grown on the same ground for several years.

From the time of sowing in April until harvesting in October the following rainfall was recorded :—May, 11 points; June, 405; July, 263; August, 127; September, 151; October, 59; total, 1,016 points. Most of this, it will be seen, fell in June and July. It was in these two months, when the crop was quite small, that the damage was done. One irrigation only was given in the spring.

The yields were as follows :—

	tons	cwt.	qr.	lb.
Firbank wheat and vetches	3	9	2	24
Sunrise oats and vetches	5	6	1	24
Cape barley and vetches	2	9	3	26
Trabut barley	2	1	3	4
Guyra oats	5	19	3	16
Florence wheat	3	2	0	22

The Crops.

For an irrigation area the results are very poor, and are not a true reflection of what can be grown. This plot, however, poor as it was, provided the settler with a valuable grazing paddock for several weeks, as the crop had been allowed to grow to that stage when the maximum weight was obtained. It is generally recognised as good practice to feed crops off fairly early if growth is forward. Here, unfortunately, the practice seems to be to keep on feeding off. By allowing the grazing crops to grow into a crop before feeding it will be found that more feed will be obtained, giving a better return for the labour invested in sowing it.

It will be seen that oats are the outstanding crop in the trial, due largely to its greater ability to withstand water in excess. The general use made of this crop among dairymen shows that it finds considerable favour, which is not surprising, for few winter crops show the same adaptability as to times and manner of sowing or the same persistency of growth.

By planting very early in the year (February and March) it is possible to obtain from oats, by careful grazing, good green fodder for the greater part of the year. When vetches are added, the feed value of the crop is naturally

increased, and settlers can be confidently recommended to add either this valuable legume or field peas to their winter fodder crops. Sunrise oats gave much quicker feed than Guyra oats. Barley and wheat were disappointing, both singly and in the mixtures with the vetches. Though coming away fairly quickly at the start, they remained in a dormant state practically throughout the winter, and the resulting crop in the spring had no body.

From the performance of barley in the trial, it might be concluded that it is not a suitable crop for grazing. Under some conditions it is not, but when sown early and allowed to make a good growth before being eaten down, it will be found to give a much greater quantity of good feed.

Spraying Experiments for Downy Mildew.

Various experiments in spraying for the control of downy mildew were conducted at Narara Viticultural Nursery last season. Bordeaux mixture was tested at the strengths of 6–4–40, 6–4–50, and 10–5–50, also at 6–4–40, with casein as a spreader (1 oz. to 10 gallons of the mixture), and at the same strength with fish oil as a spreader (1 pint to 25 gallons mixture). A proprietary Bordeaux preparation and a proprietary Burgundy mixture were also tested. The season was an exceptionally dry one, and downy mildew did not make an appearance until very late in the season and even then in a very mild form. Applications of the above sprays were made on 29th December, 31st January, 21st February, 7th March, and 4th April. No difference was noted in the effect of the various sprays; all the tests were effective in checking the small amount of downy mildew present and the effect of the sprays on the foliage was similar. Casein and fish oil demonstrated their value so satisfactorily as spreaders that it is intended to use casein in all future spraying with Bordeaux mixture.—H. G. White, Superintendent, Narara Viticultural Nursery.

The First Haystack.

The following paragraph from the Bellingen *Northern Courier* of 11th December, 1923, tells its own tale :—

"The Bellinger River, like other portions of the north-eastern part of the State, is still in the grip of one of the severest droughts experienced for many years, and the dairy-farmer is having a very bad time. Reports from various districts state that cattle are dying in numbers, while in many places watercourses, which have never been known to cease running, are fast drying up altogether. In one way, perhaps, the drought has done good by impressing upon farmers the necessity of conserving fodder to tide themselves over similar distressing periods in future. It has been left to an Englishman, Mr. E. W. Dale (who now occupies what is known as 'Watson's farm,' situated within a quarter of a mile of the town) to show the way in fodder conservation. Five months ago, when he took over the farm, he planted 10 acres of oats. Since then he has reaped, stacked, and thatched about 20 tons, equal to 2 tons per acre of fine prime hay. As far as fodder is concerned, Mr. Dale can laugh at the drought. We are informed that he has been offered as much as £9 per ton for his hay, but he wishes to reap the fruits of his own energy and industry. The haystack is said to be the first seen on the river."

Crop-growing Competitions, 1923.

SOME FURTHER JUDGES' REPORTS.

The Barellan, Berrigan, and Finley Competitions.

A. N. SHEPHERD, Senior Agricultural Instructor.

COMPETITIONS were inaugurated by the agricultural societies at Barellan, Berrigan, and Finley during the 1923 season, and in every case the competition was taken up enthusiastically by the farmers, as was evidenced by the number of entries received, viz., forty-one, twenty-six, and twenty-three respectively. The high order of the crops submitted for adjudication gave some indication of the good class of farming now being practised in those districts.

Barellan.

Barellan is now the largest wheat-growing centre in the State. Many types of soil are met with in the district, from the heavy black and grey on the south side of the railway line, to the lighter mallee and pine country to the north.

Following the very dry summer, when very little rain fell to improve the fallows and allow of moisture being stored for the following crop, the crops were sown dry in most instances. In a few cases beneficial showers were experienced in May, but in general the main falls did not occur till June, when a very wet period followed till August, after which the rains greatly diminished The registrations at Mr J. Nolan's at Colinroobie were as follows :—

	Points.		Points.
May	77	August	62
June	491	September	110
July	241	October	100

Total, 1,081 points.

Flag smut was very prevalent throughout the crops, and this was especially so with Canberra. A very interesting case was seen on one farm—not a competition crop. Two drills had been used in the sowing. Exactly similar seed and treatment had been adopted, but the crop that had been sown with one drill was very badly affected with flag smut, over 70 per cent. of the crop having been taken, while that sown with the other drill had only slightly suffered from the disease. This occurred right throughout the plot, every alternate width of the drill being as described. The explanation may be that the badly-diseased crop was sown with a hoe drill, which put the seed in deep, right amongst the fungus spores, with the result that the wheat seed and the spores germinated together. Hence the diseased plants. In

the other case, a disc-drill was used, and only shallow sowing resulted, the seed thus being placed in soil that, owing to the working of the fallow after rain, should have been practically free from fungus spores. The moisture had germinated the spores, and the cultivation had killed them. The disc drill also left the soil loose on the surface, and many of the spores may have germinated and perished, owing to unfavourable conditions and lack of moisture.

Bunt was noted in two instances, and rust in one crop. Foot-rot was seen in most of the crops to a minor extent, and odd patches of take-all were also in evidence. Undergrowth and weeds were prevalent more or less throughout the crops, but, as already stated, this was due to the season. Black oats were also to be seen to a fair extent.

Another defect that should be taken more note of by farmers is the occurrence of barley throughout the crops inspected, with a few exceptions. This class of thing calls for more attention in the selection and care of the crops to be used for seed purposes.

DETAILS of Awards.

Name.	Superphosphate per acre	Yield.*	Type and Purity. Max. 20.	Freedom from Disease. Max. 20.	Evenness. Max. 20	Cleanliness †	Condition and Appearance ‡	Total.
	lb.	bus.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
A. H. Jennings	54	33	20	18	18	26	25	140
R. Thompson	40	31	18	18	19	27	26	139
G. Gow	45	31	19	19	16	27	25	137
Nolan Bros.	60	28	19	18	18	27	25	135
G. Gow	45	30	18	19	16	27	24	134
E. B. Allen	55	28	18	19	17	25	24	131
A. H. Jennings	54	27	19	18	18	26	23	131
B. H. Hume	52	26	18	18	19	25	24	130
R. Thompson	40	30	18	18	18	23	23	129
W. S. Rayment...	56	26	19	18	18	23	24	128
S. Hulme	56	23	18	18	17	26	25	127
T. M. Coughlan...	..	27	19	18	17	23	23	127
T. C. Davies	37	21	20	19	17	25	24	126
J. Nolan...	45	27	17	18	18	22	24	126
A. G. Trembath	55	25	18	18	18	24	23	126
J. S. Leitch	...	21	18	18	17	25	24	123
G. Bryce	65	25	18	17	18	22	23	123

* One point for each bushel of apparent yield.

† Maximum for first crop 24 points, second 25, third 26, fourth 27, fifth 28, sixth 29, over six crops 30 points.

‡ Maximum for first crop 24, second 24½, third 25, fourth 25½, fifth 26, sixth 26½, seventh 27, over seven crops 28 points.

Canberra appears to have held pride of place with the farmers in the past, but owing to its susceptibility to flag smut it is not going to be sown to such an extent during the coming season. Some very fine crops of Bomen—a red wheat, the growing of which is not being encouraged—were also seen.

Quite a large area is sown with Federation, and provided good seed is available this variety will displace Canberra to a large extent, even though it be not quite so early. Yandilla King is another variety that does exceptionally well, and of the newer varieties Gresley and Waratah appear to be suitable to the district. Gluyas is grown to a small extent, but owing to its weak straw is not a great favourite. The same may also be said of Minister, although this variety is of a high milling standard. Odd crops of Major, Penny, and Currawa were also to be seen.

Practically all the crops were grown on fallow land, and it is now becoming the custom with farmers, seeing the better yields obtained, to sow wheat only on fallow, reserving the stubble land for oats. It may be mentioned that the latter crop is now being grown much more extensively than previously in the Barellan district.

A table of the points awarded the leading competitors appears on the preceding page.

Berrigan.

Twenty-six crops were judged in this competition, Bomen gaining first and second awards. This wheat gives very good returns in the district, being fairly disease-resistant, and having a strong straw that enables it to stand up well to the windy weather. Most of the crops in the competition were grown on land that had produced as many as twenty crops, and the cleanliness of the present crops was sufficient evidence of the high standard of farming in the district. Very little undergrowth was noticed in the crops, although in some cases a little black oats were to be seen. Intermixture of barley was also absent.

The rainfall registrations were :—

During the fallow period—

	Points.		Points.
July	149	December	103
August	133	January	18
September	185	February	Nil.
October	157	March	Nil.
November	Nil.	April	31

Total, 776 points.

During the growing period—

	Points.		Points.
May	152	August	60
June	445	September	92
July	290	October	109

Total, 1,148 points

Much less flag smut was in evidence in this district than at Barellan. A little foot-rot and take-all were also seen.

DETAILS of Awards.

Name.	Superphosphate per acre.	Yield.*	Type and Purity. Max. 20.	Freedom from Disease. Max. 20	Evenness. Max. 20.	Cleanliness †	Condition and Appearance.‡	Total.
	lb.	bus.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
G. Webster	50	33	18	18	19	27	26	141
D. A. McLeod	35	33	17	19	19	26	26	140
G. Hemming	70	32	18	19	19	26	25	139
D. Dickie	45	31	19	18	19	26	26	139
G. Shuttleworth	56	31	18	19	19	26	25	138
G. Pyle	80	31	16	19	18	26	26	136
E. Mudge	80	28	18	19	19	26	26	136
Mrs. Aitken	53	27	20	17	18	28	26	136
E. Mudge	80	28	18	19	19	26	25	135
G. Anderson	60	32	18	19	18	25	23	135
H. Dunn	100	30	18	17	18	26	26	135
J. W. Nicholas	60	29	18	18	19	26	25	135
J. Fisher	50	26	19	19	19	25	26	134
E. Watson	63	28	18	18	18	26	26	134
G. Dickie	50	27	18	18	18	26	26	133
J. Fisher	50	26	19	19	18	26	25	133
E. Watson	63	27	19	19	18	26	24	133
J. W. Nicholas	60	27	18	18	19	26	25	133

*One point for each bushel of apparent yield
†Maximum for first crop 24 points, second 25, third 26, fourth 27, fifth 28, sixth 29, over six crops 30 points.
‡Maximum for first crop 24, second 24½, third 25, fourth 25½, fifth 26. sixth 26½, seventh 27, over seven crops 28 points.

Federation was easily the most favoured variety, while others, such as Nabawa, Merriden, and Minister, were also judged. They all showed a weakness in the straw, the heavy wind storms breaking much of the crop off. To give some idea of the quality of the crops, it may be stated that the estimated average yield for the whole competition plots was 28·3 bushels per acre. In not a single case was anything approaching a poor crop shown, and twelve points covered the difference between the highest scoring crop and the lowest. The awards for the leading crops in the competition accompany in tabular form.

Finley.

For a first attempt, Finley society should be proud of their record of twenty-three entries and the high standard of the crops shown. The season very much approached that at Berrigan, the rainfall registrations being as under :—

During the fallowing period—

	Points.		Points.
July	144	December	90
August	115	January	17
September	129	February	Nil.
October	173	March	Nil.
November	Nil.	April	Nil.

Total, 668 points.

During the growing period—

	Points.		Points.
May	... 163	August	... 50
June	... 408	September ...	... 128
July	... 361	October	... 101

Total, 1,211 points.

Flag smut was the most prevalent disease encountered, but only in a few cases was it of such extent as greatly to reduce the yield. Foot-rot and take-all were also noticeable, while in one case the crop was badly affected with bunt.

A good deal of black oats was also growing in many of the crops, and barley in some instances.

Some of the crops showed tipped ears, and much of the early wheat was pinched.

The points allotted the leading competitors are presented in the following table :—

DETAILS of Awards.

Name.	Superphosphate per acre	Yield.*	Type and Purity. Max. 20.	Freedom from Disease. Max. 20	Evenness. Max. 20.	Cleanliness †	Condition and Appearance.‡	Total.
	lb.	bus.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
H. Kentish	58	33	19	18	19	25	25	139
J. Quinn	52	33	18	18	19	25	25	138
J. McCullock	80	32	19	18	19	24	25	137
A. Kentish	58	31	18	18	18	27	24	136
W. Cowan	45	29	19	19	19	24½	24½	135
T. Sleeman	56	31	18	18	18	26	24	135
J. Bourke	50	25	19	18	19	27	25	133
J. Dale	...	29	19	14	19	26	24	133
J. McCullock	80	29	18	17	18	26	25	133
J. Grace...	65	27	19	18	19	25	24	132
Scoullar and McNair	55	27	17	18	18	25	25	130
J. Bourke	50	24	18	18	18	26	25	129
J. Grace...	65	26	19	17	18	25	24	129
R. Pyle	35	25	19	18	19	25	22	129
P. Carrigan	56	24	19	17	18	27	24	129

*One point for each bushel of apparent yield.

†Maximum for first crop 24 points, second 25, third 26, fourth 27, fifth 28, sixth 29, over six crops 30 points.

‡Maximum for first crop 24, second 24½, third 25, fourth 25½, fifth 26, sixth 26½, seventh 27, over seven crops 28 points.

The Gilgandra Competition.

B. M. ARTHUR, Agricultural Instructor.

In view of the climatic conditions which the wheat areas of the middle western slopes and plains have experienced during the past two years, and the failure of the great majority of crops both last season and this, it was extremely pleasing to find that the Association was able to submit a total of eleven entries, which, on the whole, though light yielding, were worthy of being submitted for inspection. and which showed the careful attention to cultural details that usually ensure success.

The season as a whole was adverse to good results. Fallows were in many cases fallows in name only, as except for a fall in December, 1922, of 2½ to 3½ inches, practically no rain of any consequence was recorded from August, 1922, to May, 1923—a period of ten months It was not possible, therefore, for farmers to work their fallows with a view to ensuring the very essential consolidation of the soil and the conservation of moisture; nor was it possible to force a germination of weed seeds, such as black oats and wild mustard. Consequently, the crops were generally dirty with weed growth, and lost points. Diseases, such as bunt, loose smut, and especially flag smut, were also more prevalent than would have been the case if the wheat seed had been sown in a moist seed-bed instead of a dry one, which meant that the fungus spores of these diseases germinated simultaneously with the wheat, and had every opportunity of attacking and entering the system of the young growing crops.

Mr. M. Kilfoile, Tooraweenah, produced the winning crop This was an excellent crop of Florence, which in many respects was hard to fault. It was grown on dark, heavy, red loam, mouldboard ploughed in August, 1922, to a depth of 4½ inches, springtoothed in February, harrowed in April and drilled early in May, using 45 lb. per acre of graded pickled seed. The crop was true to type, contained an odd stranger, was free from disease, had germinated and stooled well, and was even in appearance. Points were lost owing to the presence of black oats, wild mustard and barley grass, but it was comparatively clean under the conditions of growth. The yield was estimated at 22 bushels per acre.

The second crop was produced by Mr. Walter Barden, Gilgandra, and was easily the heaviest yielding crop seen, parts of it being estimated to go 39 bushels per acre, but it was very patchy and would not average more than 26 bushels. It lost points for the presence of strangers in Rymer, for not being even, and for the presence of black oats and barley grass In parts also the ears had wilted and had been tip-frosted. This crop was also grown on fallow, disc-ploughed August to November, and disc-cultivated in December It was noticeable that the earlier the ploughing, and consequently the greater the conservation of moisture, the better the crop. The paddock

DETAILS of Awards.

Name of Competitor.	Variety.	Crop Details.				Rainfall.		Points Awarded.						
		Date of Sowing.	Previous condition of Land	Number of Crops on Land.	Seed per Acre.	On Fallow	On Growing Crop	Estimated Yield *	Trueness to Type Max 20	Freedom from Disease. Max 20	Evenness. Max. 20.	Cleanliness. †	Condition and Appearance. ‡	Total.
					lb.	pts.	pts.							
M. Kilfoile	Florence	First week May	August fallow	9	45	530	958	22	19	20	18	25	26	130
W. Barden	Rymer ..	Second week May.	Aug.-Sept fallow	15	49	477	931	26	18	19	16	26	24	129
F. W. McKenzie	Canberra	Third week May	July-Aug fallow	8	60	530	908	20	19	15	19	26	26	125
G. Wilson	Bunyip	Third week April	Wheat stubble	5	60		933	16	17	20	18	25	24	120
P. Law	Canberra .	First week May	Aug.-Sept. fallow	First	49	657	632	19	18	18	19	23	22	119
E. G. Altmann .. .	Greeley and Gold Top	Second week May	August fallow	9	60	530	908	19	17	14	16	22	26	114
W. Hickman ..	Florence	Third week May	Wheat stubble	3	45		848	15	18	19	16	24	22	114
N. Reichelt ..	Canberra .. .	Third week May	Summer fallow	10	60		908	11	19	17	16	23	24	110
F. F. Walker . ..	Canberra .	Fourth week May	Wheat stubble	3	52		958	14	17	16	19	21	23	110
I. H. Wheatley . ..	Florence and Canberra.	Third week May	New ground .		45		915	18	11	18	18	23	20	108
A. Richards . .	Canberra ..	First week June	Wheat stubble	4	38		858	14	17	10	19	23	24	107

* One point for each bushel of apparent yield.
† First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.
‡ First crop, 24 points; second, 25; third, 26; fourth, 27; over four crops, 28 points.
On Mr. Altman's land superphosphate was applied at the rate of 60 lb. per acre.

was ploughed in lands at various intervals, commencing in August, and afterwards received the same treatment, resulting in an estimated yield of from 40 bushels to strips which would hardly return seed.

The crop filling third place was grown by Mr. F. W. McKenzie, of "Biddon," and was a nice looking crop of Canberra grown on heavy red to black soil clay loam, which had been mouldboard-ploughed July-August 4 inches deep and harrowed, springtooth-cultivated October and again in December; 60 lb. graded pickled seed was sown, no manure being used. The variety was true to type, but lost several points owing to the presence of bunt, loose and flag smut, also black oats and mustard. The estimated yield was 20 bushels per acre.

The yields of the other entrants were all estimated to be less than the first three. Most of the crops were reasonably true to type and free from strangers. Selection for trueness to type and the use of pure graded seed, which should always be treated for bunt, &c., are important factors in the production of high yields.

Bunt (*Tilletia tritici*) was present in two crops, being very bad in one particular crop, and, together with flag smut, reduced the yield probably by 30 to 40 per cent Bunt is controllable by the use of fungicides, such as bluestone, formalin, or dry copper carbonate, and its presence can only be put down to carelessness, or the sowing of untreated infected seed. Canberra was the wheat affected in both instances.

Loose smut (*Ustilago tritici*) was present in eight out of the eleven entries, Florence being the only variety apparently resistant to this disease, which can also be minimised by treating the seed with a fungicide, though prevention is not a certainty.

Flag smut (*Urocystis tritici*) was also present in the majority of the crops, and in several to an alarming extent. This disease seems to be spreading very rapidly among the State's wheat crops, and its advent should be looked upon with some concern. It is not an easily controllable disease, as the fungus spores mainly exist in the soil, and to a lesser extent on the grain at harvest time. Methods of control are the burning of infected stubbles, early fallowing, and frequent cultivations after suitable rains to ensure germination of the spores (and a consequent starving out of the parasite), the rotation of an oat crop (which is not subject to this disease), and the treatment of the seed with a fungicide as for bunt or stinking smut.

Take-all and foot-rot were not noticeable, and apparently the Gilgandra district is at present free from these diseases of the wheat plant.

The three leading crops were grown on fallowed land, and easily outstripped the other competitors in yield, besides being cleaner and more free from disease, and this result was achieved in a year when only about 5 inches of rain was recorded during the fallowing period. This should be proof conclusive that the early ploughing and subsequent workings will stick to the crop when it is most in need of assistance, and thus ensure payable yields.

Only one crop entered in the competition was manured, and this failed to obtain a place, though yielding well. But results obtained from experiments on the Government variety plots have shown increases due to the application of superphosphate, and farmers would be well advised to experiment with small quantities of superphosphate on their soils, not so much with the object of increasing the fertility of their soils, but to ensure a vigorous early growth and an earlier ripening.

Australian Wheats.

The Institute of Science and Industry has just published a new bulletin on the classification of wheat varieties. The bulletin is a revision and extension of one published by the Institute in 1920, and, like it, has been prepared by the special committee on seed improvement, under the chairmanship of Mr. A. E. V. Richardson, Director of the School of Agriculture, University of Melbourne. It contains information of a practical and scientific nature on eighty-two of the most important Australian wheat varieties. The first portion is concerned mainly with the botanical classification of the wheat species, and gives an account of the various characters which may be used for classifying varieties into classes and types, such as colour of chaff, presence or absence of beard, and colour of grain. Special consideration has been given to ascertaining the variability of such agricultural characters as height of straw, stooling capacity, and season of ripening. In order to gather reliable information on this subject an experiment was conducted with specially selected seed, which was grown at the experimental farms in the different States, and the agricultural characters were then carefully compared. The State Agricultural Departments very cordially co-operated to this end by taking accurate observations of the plants throughout their growth.

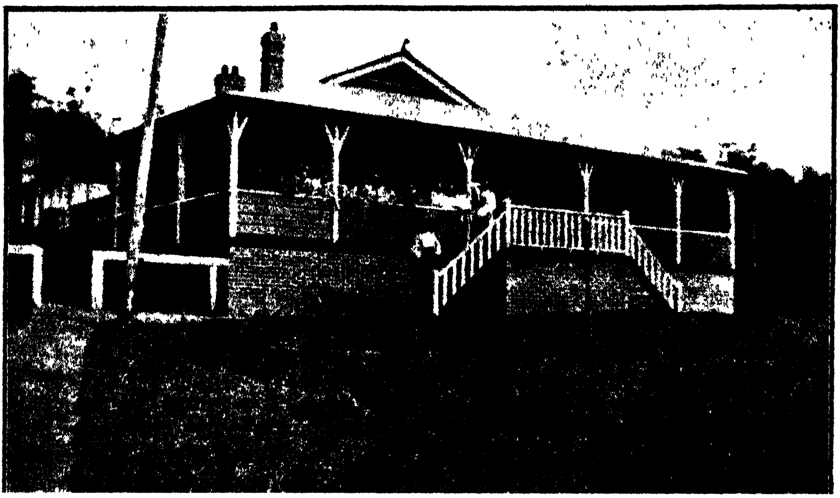
The bulletin contains photographs illustrating characters of assistance in identifying varieties. Copies will be supplied to inquirers on application to the Institute.

The Influence of an Agricultural Life.

No one doubts that our national life would be the poorer by a decline in our rural life; but it is sometimes difficult to state in definite terms the extent of the loss. It is well known, however, that contact with the soil leads to an appreciation of nature and natural phenomena, which it is difficult, if not impossible, to obtain in any other way. History and literature and art have shown throughout the ages that daily contact with the elemental forces of nature breeds independence of character, virility of mind, constancy of purpose—qualities included among those accounted worth while in life. And if perchance at times these are allied with other and less desirable accompaniments, the latter, more often than not, are attributable to causes which a well-organised national life could remove or control.—John Strong, Professor of Education, Leeds University.

THE AMENITIES OF COUNTRY LIFE.

WHAT may be done in the way of making the farm dwelling and its surroundings attractive is illustrated in these two pictures, which tell an interesting story for themselves.—H. G. WHITE, Superintendent, Narara Viticultural Nursery.



A Residence at Narara Viticultural Nursery in December, 1919.

The same Residence two years later

The couch and paspalum grasses have been removed and the land terraced, one terrace being laid down in buffalo grass, the next planted entirely with roses, and the lowest planted with trees and shrubs and a row of *Phœnix canariensis* palms, while a flower border with buffalo grass edging runs from gate to house.

Maize Trials.

CENTRAL NORTH COAST, SEASON 1922–23.

J. M. PITT, Senior Agricultural Instructor.

TRIALS were conducted during the season in co-operation with the following farmers :—

Variety Trials.—
S. E. Thurgood, East Frederickton, Macleay River.
F. Parkinson, East Kempsey, Macleay River.
D. Dornan, East Frederickton, Macleay River.
T. J. Webster, West Kempsey, Macleay River.
J. G. Ward, Sherwood, Macleay River.
S. Dawson, Burrapine, Nambucca River.
R. Richardson, Dumaresq Island, Manning River.
J. Lambert, Taree Estate, Manning River.
E. Andrews, Mount George, Manning River.
J. Campbell, Wingham, Manning River.
H. Crouch, Vacy, Paterson River.

Spacing Trials.—
C. Lean, Glenthorne, Manning River.
G. Levick, Taree Estate, Manning River.
R. Richardson, Mondrook, Manning River.
D. Dorward, Dumaresq Island, Manning River.
J. P. Mooney, Dumaresq Island, Manning River.

Pure Seed Plots.—
S. E. Thurgood, East Frederickton, Macleay River.
D. Dornan, East Frederickton, Macleay River.
T. J. Webster, West Kempsey, Macleay River.
F. Waters, East Kempsey, Macleay River.
H. Medlock, Frederickton, Macleay River.
C. Resby, Euroka, Macleay River.
J. Campbell, Wingham, Manning River.
C. Lean, Glenthorne, Manning River.
G. Levick, Taree Estate, Manning River.
R. Richardson, Mondrook, Manning River.
D. Dorward, Dumaresq Island, Manning River.
J. P Mooney, Dumaresq Island, Manning River.
A. Longworth, Ghinni, Manning River.
W. Murray, Kolodong, Manning River.
J. Clune, Dumaresq Island, Manning River.
E. W. Alway, Moto, Manning River.
A. H. Norris, Mount George, Manning River.
D. Cameron, Mount George, Manning River.
S. Flett, Taree Estate, Manning River.
B. Dempsey, Taree Estate, Manning River.
R. Apps, Miller's Forest, Manning River.
J. Perrett, Miller's Forest, Manning River.

The demand by farmers for maize experiment plots on the Macleay—in fact, throughout the whole Central North Coast district—showed a marked improvement in the past season compared with previous years. No doubt the maize competition plots conducted in the central coastal maize-growing districts, the good price maize has been realising, and the doubtful outlook for the dairying industry, have been factors in the increased interest manifest among the numerous maize farmers.

In addition to inquiries for the comparatively newer early-maturing varieties, especially on the Macleay, the object being to discover a maize having all the features of the popular Golden Superb variety—a variety that has been running out of late years—there has been a keen demand for pure seed plots of the varieties holding leading positions in the various competitions.

The outstanding yields during the past season on the river were from Fitzroy, Large Red Hogan, and Golden Beauty among the main crop varieties, and Funk's Yellow Dent and Wellingrove of the early-maturing sorts. The latter varieties have created a very favourable impression where recently introduced. Unfortunately the Manning trials were mostly failures, owing to the extremely droughty conditions—only the very early (those late sown) and an odd plot in a favoured position being able to mature.

Funk's Yellow Dent, at Mr. D. Dornan's Farm, Macleay River.
Yield 93 bus. 19 lb.

A very satisfactory trial was conducted at Vacy, on the Paterson River. Maize farmers in the Hunter River district have in the past been slow to avail themselves of the possibilities of maize trials conducted by the Department. However, now that branches of the Agricultural Bureau are springing up in mushroom fashion greater interest is being taken, and there is a keen demand for trials next season.

Seasonal Conditions.

The weather conditions were unusually dry, with the possible exception of the Nambucca River, where thunderstorms occurred very frequently. Further south, on the Macleay, after the heavy September rains, which were general throughout the coast, a very meagre rainfall occurred. Apart from an occasional thunderstorm, perhaps once a fortnight, no rain of value

occurred until December and January, and the remainder of the season was moderately dry. The drought was more severely felt along the Hastings, the Manning, the Upper Manning, and through to Gloucester and Dungog than anywhere on the coast.

Along the Manning practically no rain of value fell between September and the New Year, and a further long dry spell occurred in the autumn. Yields were harvested on the picked and best favoured areas only, the majority of the plots being used for fodder.

The Hunter and tributaries also experienced a very dry time, but the Vacy plots were in the track of thunderstorms during the summer and fared better than surrounding places.

The good yields on the Macleay plots and the single plot on the Manning were due to a great extent to the thick top-dressing of flood deposit left during the 1921 flood, and to the thorough preparation of the plots throughout the winter months.

It is becoming more apparent to maize growers that the thorough preparation of the soil, coupled with fallowing during the winter months, using a leguminous crop such as field peas or vetches, perhaps every second year, as a rotation crop, and planting seed from high-yielding strains only, are methods that more or less must be adopted nowadays to get maximum results from maize-growing. Competition plots have given a great impetus to maize-growing generally, and one sees on all sides leading varieties being sown in preference to the nondescript and poor-yielding sorts. Another indication of progress attributable to the competitions is that farmers with the highest yielding strains are readily co-operating in having seed of these much-sought-after types made available for more general sowing. It is worthy of mention that the winning competitors in the year's competition plots were men who discarded poor-yielding varieties and adopted pure seed plots all within a period of three years. By using approved methods in the selection of their seed, these farmers have raised their strains to a very high standard.

The rainfall in the table is not an indication of the actual state of affairs. High westerly and northerly dry winds, accompanied by extreme heat, invariably followed each fall of rain. Taree is quoted as perhaps representative of the Manning River falls, and Kempsey as representative of those on the Macleay.

	Taree.	Kempsey.	Burrapine.
1922.—	Points.	Points.	Points.
September	1,070	630	......
October	151	155	......
November	12	130	......
December	181	203	98
1923.—			
January	311	235	375
February	37	181	201
March	......	......	308
April	......	......	1,331

TABLE of Yields in Variety Trials.

Varieties.	Burrapine.	East Frederickton	S. Churgood, East Frederickton	F. Parkinson, East Kempsey.	West Kempsey.	Taree Estate.	Vacy.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Manning Silvermine ...	42 8	......	......	......	......	......	68 28
Leaming	52 48	......	......	......	......	......	72 55
Farmer's Leaming ...	......	......	72 28	......	......	......	......
Manning White ...	49 48	......	......	......	......	......	......
Golden Beauty ...	72 48	......	56 54	......	86 16	61 8	55 14
Yellow Hogan ...	67 8	......	......	......	......	......	69 54
Fitzroy	90 0	......	69 51	......	96 44	......	72 55
Large Red Hogan ...	52 8	......	......	......	......	......	70 40
Pride of Hawkesbury	70 0	......	72 28	......	......	......	63 19
Ulmarra Whitecap ...	82 8	......	......	......	......	......	62 34
Large Yellow Horse-tooth.	94 16	......	......	......	......	......	......
Manning Pride ...	......	......	......	......	99 33	......	......
Large White Horse-tooth	......	......	......	......	......	......	75 48
Hickory King ...	......	......	......	......	......	......	77 5
Golden Nugget ...	......	......	......	......	......	......	72 37
Golden Glow	......	90 30	......	75 40	......	......	......
Early Morn	......	79 34	......	......	......	......	......
Wellingrove	......	100 32	54 21	61 24	115 11	90 0	......
Funk's Yellow Dent...	......	93 19	69 51	81 24	105 2	74 16	......
Local Golden Superb Strain (1).	......	......	68 49	89 16	104 20	......	......
Local Golden Superb Strain (2).	......	......	......	......	99 17	......	......
Golden Superb ...	......	......	......	......	......	77 8	......
Kennedy	......	99 17	......	......	......	......	......
Eureka	......	......	......	......	......	87 8	......

Variety trials grown by Messrs. B. Richardson, E. Andrews, J. Campbell, and some of the pure seed plots were partial failures and were used for cow fodder.

Sowing Trials.

A few trials with popular varieties were conducted on farmers' plots on various parts of the Manning.

The object of the trials was to compare the distance usually adopted in the competition plots—namely, four grains every 3 feet in the drills with "single-drop" and other distances apart in the drill. Although the season was not a favourable one some returns are available.

Plots sown by Messrs. R. Richardson, Tinonee; D. Dorward, Dumaresq Island, and Mr. J. P. Mooney's Fitzroy plot at Dumaresq Island, were not harvested owing to conditions not being favourable to accurate comparative yields. In almost every instance the wider spacing gave the highest yield.

C. LEAN, Glenthorne (Hickory King).

					bus.	lb.
Rows 4 ft. 0 in. apart;	4 grains every	3 ft. 0 in.,	in drill	...	67	2
" 4 ft. 0 in. "	1 grain every	9 inches,	"	...	55	5
" 3 ft. 9 in. "	4 grains every	3 ft. 0 in.,	"	...	58	52
" 3 ft. 9 in. "	2 "	1 ft. 6 in.,	"	...	55	0
" 3 ft. 0 in. "	4 "	3 ft. 0 in.,	"	...	60	50
" 4 ft. 3 in. "	2 "	2 ft. 3 in.,	"	...	58	15

J. P. MOONEY, Dumaresq Island (Leaming).

			bus.	lb.
Rows 3 feet apart;	4 grains every 3 feet in drill ...	...	102	8
" 3 feet "	2 " 1 ft. 6 in. in drill ...	...	92	16
" 3 feet "	single drop (1 grain every 9 inches)	...	90	20
" 4 feet "	4 grains every 3 feet, in drill ...	...	92	14
" 4 feet "	2 " 1 ft. 6 in. in drill ...	...	79	4

G. LEVICK, Taree Estate (Large Red Hogan).

			bus.	lb.
Rows 4 feet apart;	4 grains every 3 feet in drill ...	...	97	8
" 4 feet "	2 " 1 ft. 6 in. in drill ...	...	102	0
" 4 feet "	1 " 9 inches in drill ...	...	91	3

Owing to the other plots failing, it was not possible to compare closer drills as against those 4 feet apart in the longer season varieties.

A CO-OPERATIVE SHEEP DIP.

THE Inspector of Stock at Forbes lately gave an account of the conditions under which a sheep dip has been constructed co-operatively on the Forbes-Condobolin road.

The dip was brought into being by about seven small sheep-owners clubbing together and putting in about £20 each for the construction, which cost approximately £140. The dip was erected on a reserve against a boundary fence, which materially saved fencing, one of the expensive items in dip construction. A well was then sunk close to the dipping-bath, and being within range of the river drift, water was obtained at a shallow depth. Each owner who contributed has free use of the dip and any "outsider" pays 1½d. per head and finds his own dip. The dip is simply and well constructed, and works conveniently. It is being suggested that the contributors will find the dipping material in future, which will make for uniformity. Over 10,000 sheep have been dipped in this dip during the present season, and the enterprise of the farmers concerned has thus been fully justified.

The example of these farmers in the Forbes district is one of the most valuable instances of co-operation which has been brought under notice for some time, and might with great advantage be followed in many other districts. The multiplication of such dips as these will go a long way towards solving the louse and tick question, and every encouragement should be given to those who desire to construct them.—MAX HENRY, Acting Chief Inspector of Stock.

Control of Imported Seeds and Plants.

J. N. WHITTET, Agrostologist.*

AN endeavour will be made in the following paper to outline briefly the methods adopted in this State to control the importation of seeds and various plants. Our detailed examination of imported seeds has now been in operation for some thirteen years, during which period a considerable number of samples have been examined and a quantity of information has been recorded. In conjunction with the Chief Quarantine Officer (Plants) we administer the Federal quarantine regulations which control all imported seeds, and also give information as to the advisability or otherwise of allowing certain plants to be brought into the State.

The main objection that business men have to quarantine is that it restricts the freedom of the individual to a certain extent; but if free entry of all goods were allowed it would result in the country being overrun with noxious weeds. Quarantine does, to a large extent, put a stop to any country becoming a dumping ground for other countries, useless seed, and seedsmen who have been forced to clean or reship seed of an inferior or weed-infested nature will invariably ascertain, before importing, that future consignments are of good quality.

Inspection and Sampling.

Under the Federal Quarantine Act samples are taken from all consignments of seed entering this State. The samples are taken from the top, centre and bottom of the bags, and a representative lot of each consignment is forwarded to the Agrostologist for examination for impurities, such as weed seeds, dirt, ergot, smuts, &c. Each consignment is held in quarantine until the report is submitted to the Chief Quarantine Officer, and on recommendation of the Agrostologist the material is either released or held until cleaned.

If the consignment is to be cleaned, the operation is carried out in quarantine, and a sample from the cleaned bulk is then submitted for examination and report. With some seeds it is almost impossible to separate impurities from the good seed, owing to the seeds being of similar weight or size, and in cases such as these the importer reships to the port from which the material was originally consigned. If such a course is adopted the importer is required to produce the shipping papers dealing with the reshipment of the consignment in question, and either the Plant Quarantine or Customs authorities

* Paper read before the Pan-Pacific Science Congress, Agriculture Section, Sydney, August, 1923, on the quarantine of imported seeds and various plants in New South Wales.

see that the material is placed on board ship. During the process of sampling a keen watch is kept for insect pests, doubtful consignments being fumigated at once, and release from quarantine may be disallowed.

Under the Commonwealth Commerce Act all seed imported to or exported from this State must conform to the standards required; that is, it must be sound, clean, and new. The samples taken are subjected to germination and purity tests. Lucerne seed, for example, must give a germination test of at least 80 per cent. before it is admitted to or allowed to be exported from this State. Prior to the gazettal under the Customs Act of a regulation stipulating that consignments of imported lucerne seed must be stained with rouge before being released from quarantine, a considerable amount of foreign lucerne seed was imported into the State. The regulation had the effect of deterring importers from bringing in large quantities of inferior seed, and preventing cheap imported seed being sold to farmers as locally grown seed at the price of such local seed. It placed no hardship on our farmers, as more than sufficient seed is harvested in this State for our own use, and a ready sale for any surplus is always found in other States; in fact, small consignments of lucerne seed have been sent overseas since this regulation has been in force.

The effect of this restriction is not only to prevent the importation of inferior lucerne seed, but to protect our growers of this valuable commodity, and enable them to put good quality seed on the market, in addition to securing for them an adequate return for their labour.

Our State Department of Agriculture encourages progressive growers by publishing their names in the pure seed list in the *Agricultural Gazette*, thus recommending them as growers, it being required, however, that an officer of the Department shall first visit and inspect the crop, and that the farmer shall subsequently submit a sample of the harvest, the object being to ensure that it conforms to our standards of purity and germination.

Examination for Impurities.

On receipt of the sample for examination, a given quantity—1 oz. in the case of small seeds such as grasses and clovers, and 2 oz. in the case of wheat, linseed, &c.—is weighed out, and all impurities are separated from the pure seeds. The various impurities, weed and other seeds, are separated specifically, classified botanically, and the number of each in 1 lb. of the sample calculated. The total percentage of the weed impurities is then obtained. In issuing our report we classify the weed seeds under two headings: (*a*) Noxious, and (*b*) other weed seeds. Any apparent fungus diseases, such as ergots and smuts, are reported, and also the presence of insect pests, or damage created by such pests as mites, weevil or grain moth. If, during the process of testing for germination, the seed appears to be backward in growth, and weakly shoots are being thrown out instead of strong vigorous growths, it is then suspected that the seed is very old or may be diseased.

Weed-infested Samples.

The following examples give some idea of the class of seed that comes to this country at various times. They are of course extremely dirty samples, but they illustrate the need for rigorous quarantine methods. All of these samples have been received within the past eighteen months. In cases such as these, if it is found to be too difficult to clean the consignment thoroughly, it is either ordered to be destroyed or reshipped to its place of origin.

SAMPLE No. 3,316. White Clover (*Trifolium repens*).

Impurities.	No of seeds found in 1 lb. of sample
Lotus angustissimus	46,080
Sheep's Sorrel (*Rumex acetosella*)	22,272
Suckling Clover (*Trifolium dubium*)	12,800
Timothy Grass (*Phleum pratense*)	4,352
Catchfly (*Silene gallica*)	2,560
Hop Clover (*Trifolium procumbens*)	1,792
Fat Hen (*Chenopodium album*)	1,280
Rib Grass or Plantain (*Plantago lanceolata*)	384
Crane's Bill (*Geranium molle*)	256
Yorkshire Fog (*Holcus lanatus*)	192
Field Madder (*Sherardia arvensis*)	192
Self Heal (*Prunella vulgaris*)	128
Spurry (*Spergula arvensis*)	64
Chickweed (*Stellaria media*)	64
Total	92,416

SAMPLE No. 3,719. Linseed (*Linum usitatissimum.*)

Canada Blue Grass (*Poa compressa*)	22,272
Curled Dock (*Rumex crispus*)	1,792
Spurry (*Spergula arvensis*)	736
Sheep's Fescue (*Festuca ovina*)	96
Chess or Cheat (*Bromus secalinus*)	64
Smooth Hawk's Beard (*Crepis virens*)	64
Black Thistle (*Carduus lanceolatus*)	32
Total	25,056

SAMPLE No. 4,011. *Danthonia pilosa*

Hair Grass (*Aira caryophyllea*)	21,120
Cudweed (*Gnaphalium purpureum*)	9,600
Sweet-scented Vernal (*Anthoxanthum odoratum*)	2,498
Small-flowered Panic (*Panicum parviflorum*)	448
Cat's Ear or Dandelion (*Hypochæris radicata*)	126
Rib Grass or Plantain (*Plantago lanceolata*)	128
Sheep's Sorrel (*Rumex acetosella*)	64
Total	33,984

SAMPLE No. 4,021.—Yorkshire Fog (*Holcus lanatus*).

White Clover (*Trifolium repens*)	23,808
Sheep's Sorrel (*Rumex acetosella*)	23,040
Suckling Clover (*Trifolum dubium*)	17,408
Chickweed (*Stellaria media*)	3,584
Smooth Hawk's Beard (*Crepis virens*)	3,072
Perennial Rye (*Lolium perenne*)	2,304
Rib Grass or Plantain (*Plantago lanceolata*)	2,304
Cat's Ear or Dandelion (*Hypochæris radicata*)	256
Total	75,776

Some six months ago a large consignment of parrot food arrived in Sydney from Europe. The packages were of an elaborate nature, having very attractive and artistically designed wrappers, no doubt for the express intention of attracting buyers of this commodity. In a one pound of sample we found the following ingredients :-

	Seeds.
Saffron Thistle (*Carthamus lanatus*)	3,632
Sunflower (*Helianthus annuus*)	2,688
Sorghum (*Andropogon sorghum*)	846
Pumpkin (*Cucurbita pepo*)	64
Cowpea (*Vigna catiang*)	48
Wheat (*Triticum vulgare*)	32
Peanut (*Arachis hypogea*)	32
Black Oat (*Avena fatua*)	16

In addition a quantity of broken biscuit was present. The consignment was destroyed.

Agricultural Seeds Bill of New South Wales.

Under this Act is regulated the sale of agricultural seeds, and the sale of certain seeds and plants is prohibited. In this Act " agricultural seed " means farm and garden seeds which are sold for the purposes of planting, but does not include flower seeds. Certain standards of germination and purity are insisted on, the impurities including ergots, smuts, dirt, and diseased or broken seeds. The sale is prohibited of agricultural seeds which have mixed with them noxious weed seeds, and also noxious weed seeds or plants which are the produce of noxious weed seeds. To accomplish this end a list giving botanical and vernacular names of these plants is published in the regulations covered by this Act.

In quarantining impure seed and compelling vendors to clean or destroy same, the spread of undesirable plants is checked to some extent.

Establishment of Quarantine Areas.

In order to control seed imported into this State for trial purposes, it has been suggested that areas be set aside on which to grow such seed. To allow the various crops to mature seed, it would be necessary to have a number of these areas in various parts of the State, as the lucerne and clovers would require to be grown in seed-producing districts, and likewise wheat, maize, and various root crops in their respective seed-producing districts.

In a more or less self-contained country such as America, where enough grain of the various crops is grown for home use and also export, it is a comparatively easy matter to enforce quarantine; but as we import such large quantities of maize, barley, oats, vegetable and flower seeds, it is almost impossible to prevent completely the introduction of new diseases. Large quantities of grain are brought into this State for feed purposes, and introduction of diseases and subsequent infection of crops is likely to arise per medium of this material. When a disease is not apparent on the grain, it is quite possible, even when sampling material with the idea of growing

the sample taken, to miss diseased grain in the bags. It is doubtful whether a fumigant will ever be found which will kill a disease-producing fungus embedded in the tissues of the host, without being powerful enough to destroy the host.

Foreign inspection and certification, supplemented by inspection at destination, is not sufficient protection against seed-borne diseases carried internally by the grain.

All seeds or roots of grasses, clovers, lucerne, sorghum, fodder trees, and various other fodder plants imported for experimental purposes, are always grown in the strictest quarantine for twelve to eighteen months before being sent to experiment farms for further trial. At the end of this period, if the plants grown are disease-free, they are released from quarantine; but in the case of new grasses examinations are made by the Chemist for the presence of hydrocyanic acid at different periods of the plant's growth. The quarantine of such plants is of considerable importance. Among the large number of grasses received for trial from overseas during the last eighteen months were Star grass (*Cynodon plectostachyum*) and Red Rhodes grass (*Chloris petraea*). The former is a rapid-growing, succulent grass, and to outward appearance was one of the most promising introductions seen for some time. Analyses showed, however, the presence of large quantities of hydrocyanic acid at all stages of growth, and consequently this grass still remains in quarantine, and feeding experiments are to be carried out with it this summer. Red Rhodes grass also yielded HCN., but as the grass is not likely to prove of any value as a fodder plant in this State, its propagation is not being proceeded with

These instances prove the necessity for quarantine in all its phases. If no test for HCN. had been made, *Cynodon plectostachyum*, on account of its vigour and apparent palatability, would have appealed to all farmers who saw it, and its distribution would soon have been widespread.

In the foregoing, some of the difficulties likely to be met with in preventing the introduction of diseases have been mentioned, and until our Commonwealth is self-contained as far as the growing of all grain required for home consumption is concerned, there will always be the likelihood of new diseases, noxious weeds, and insect pests being introduced with imported grain and fodder.

Cow Testing in Canada.

To produce 1 ton of butter in one year, eleven average British Columbia cows would be required, whereas only six average cows in the testing associations would be necessary. This means a direct saving of the maintenance rations of five cows for 365 days, or of 1,825 days' maintenance for one cow, as well as avoiding the labour involved in milking five cows twice a day for ten months, or a total of 3,000 milkings.—Extract from Report of Cow-testing Results in British Columbia.

Dairy Farm Buildings.

THEIR GENERAL OUTLAY AND CONSTRUCTION.

[Continued from page 29.]

L. T. MACINNES, Dairy Expert, and A. BROOKS, Works Superintendent.

Machine Milking Shed with Separator Room Attached.

WHERE milking machines are used, special arrangements can be made for laying out the bails and for separating. Where large numbers of cows are milked by hand, it may be considered advisable to separate at the bails by use of an oil motor or other engine. In all such cases the accompanying plan (Fig. 9) for a separator and engine-room is applicable.

In the plan for milking machine bails (Figs. 9 to 12), provision is made for milking two cows in each division, each cow having its own exit at the head of the bail. The separator room is placed at the end of the bails nearest the cream store room or dairy; the motor and pump are placed in a separate room, the driving belt passing through a slot in the partition. The vacuum tank, vacuum pump, and oil engine are placed along the outer side of this partition with a guard rail round them. On the milking yard side and along the outer wall are placed a water-heater, wash-up vat, and draining bench. Between these and the engine and pump is a clear passage 3 feet 6 inches wide. Just outside the wall a water tank is shown; this is placed so that the water can easily be laid on to the water-heater and wash-up vat. From the bails an entrance is obtained to the separator by a close-fitting double swing-to door, and from the bails to the engine-room by a double swing-to gate, both door and gate being self-closing. It is required that the door to the separator room be always shut. At the far end of the passage between the engine and the wash-up vat another door gives an exit to the dairy or cream store room.

A plentiful supply of warm and scalding water is a necessity for washing the separator and milking machine parts, also cans, &c., and it should be obtainable on short notice. For this reason, instead of installing a copper, it is recommended that a chip water-heater (as used in bathrooms) be obtained. It takes half an hour to an hour to boil sufficient water in a copper, and ashes and dust are created in the process. With a heater like that advocated, hot water can be obtained in a few minutes, and very little fuel is needed—just a few chips, old papers, or cob husks. The price of such a heater, moreover, would come out at much less than that of a copper and stand.

In the separator room provision is made for plenty of light and ventilation. A bench is placed under the window for a Babcock tester, in order that each cow in the herd may be regularly tested for production. A 12-inch cowl is

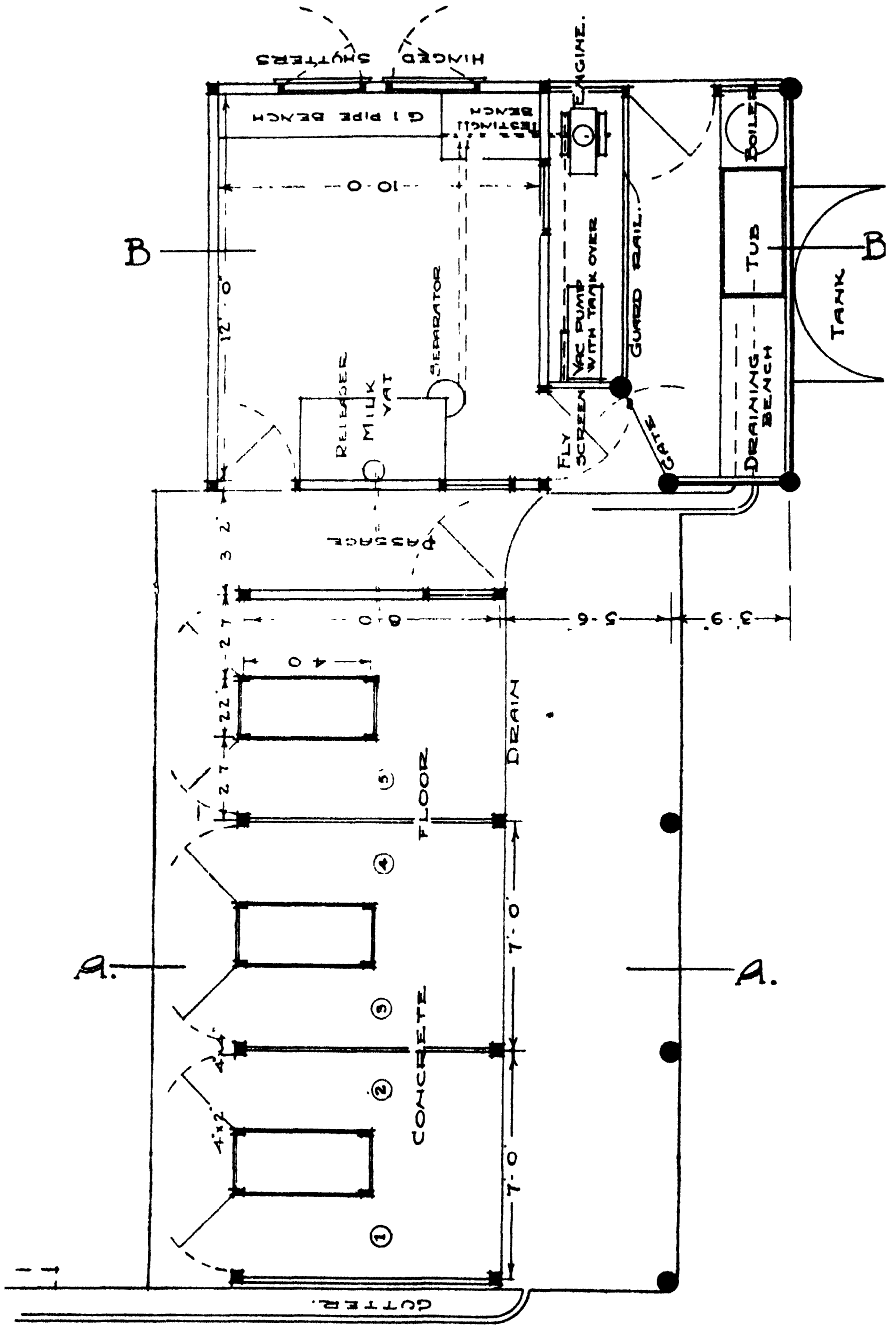


Fig. 9.—Plan of Bails for Machine Milking, with Separating Room attached.

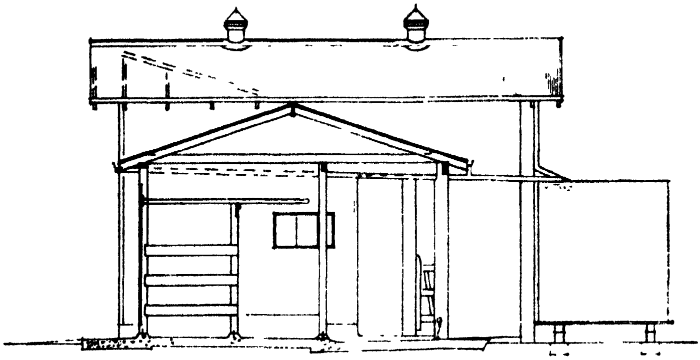


Fig. 10.—Section A—A of Fig. 9.

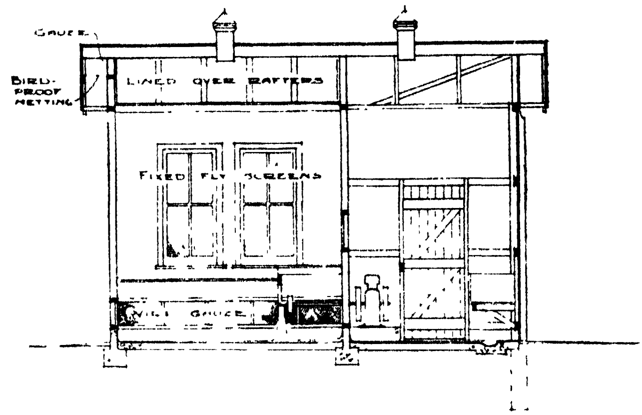


Fig. 11.—Section B—B of Fig 9

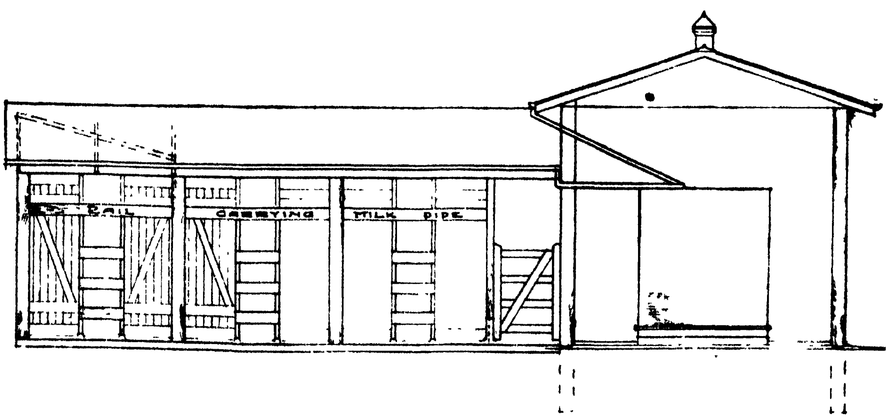


Fig. 12.—Side Elevation of Fig. 9.

placed in the apex of the roof for extra ventilation by the creation of a better draught. As far as possible the floor in the separator room should be without obstruction, such as legs of tables, stands, and benches, as this makes for better and quicker washing down. The milk-vat stand and all benches should be held by wall brackets or supports, and the separator placed on a concrete block forming part of the floor and being bevelled at the intersection.

As soon as the separating is completed, the cream should be carried away to the store room, which should be a detached building at least distant 30

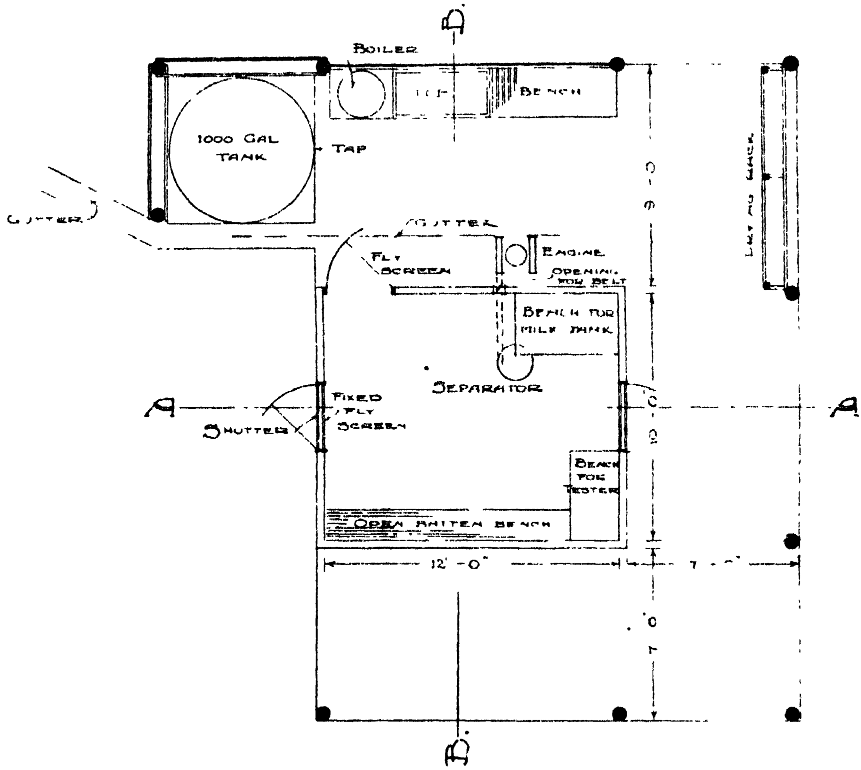


Fig. 18.—Plan of Combined Dairy and Separating Room.

feet from the bails and engine-room. The skim milk should, if possible, be gravitated in open drains or fluming to the calves or pigs; if a gravitation system is impracticable, it should be caught in cans or in a tank that can be placed on a trolley and taken away by a tram line. Underneath any skim milk tanks should be concreted and a drain supplied connecting with the main drain.

Cleaning the Bails and Yards.

The utmost care should be taken that no old milk or milky water is allowed about the dairy or bails, either in vessels or spilt on the ground; if this rule is not strictly observed, flies will be attracted and smells created. As soon

as the milking and separating operations are completed, all utensils and machine parts, cans, &c., that have come in contact with milk, should be thoroughly washed in tepid water, then scalded and placed on racks to dry. The floors and drains of the separating room and milking shed should be washed down, and the yard cleaned of any excreta. The latter should be at once taken away to the manure heap, which ought to be not less than 30

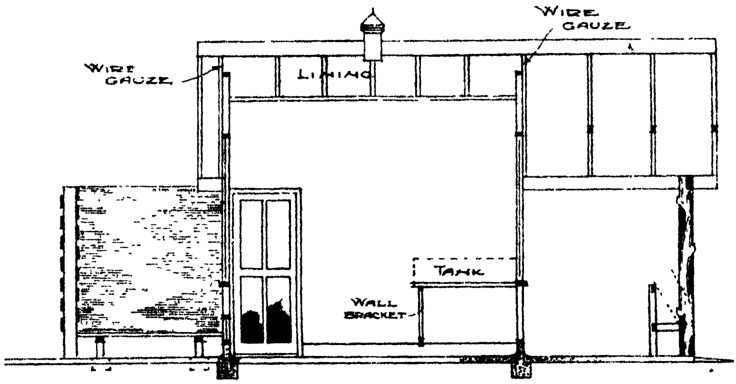


Fig 14.—Section A -A of Fig. 13.

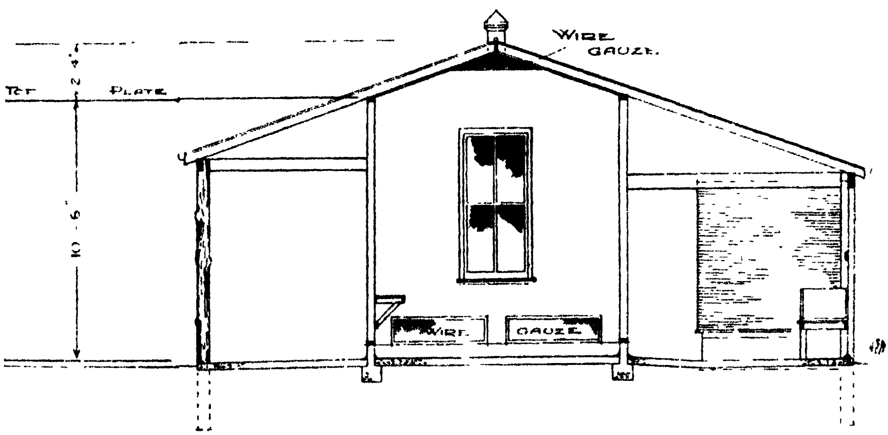


Fig 15 —Section B – B of Fig. 13

yards distant and protected from calves, poultry, &c. The sweeping of the yard should not be commenced until the whole milk or cream has been taken away from the vicinity of the bails.

A Combined Dairy and Separator Room.

When separating is done by hand, or where it is not considered advisable to separate either by hand or by power at the milking shed, it is usual to construct one building to serve the combined purpose of a separating and

storing room. As by far the greater number of dairy farms are equipped in this way, the plan shown in Figs. 13 to 16 should have a wide appeal. In a subsequent article there will appear plans and specifications of a combined dairy and separator room built with concrete slabs.

The building now under consideration, as with the others described in these articles, is planned to be constructed as easily and cheaply as possible, the roof being the gable-end style. The ceiling follows the contour of the roof, thus providing more air space and ample ventilation, and in addition to the usual openings, the gable ends are also netted to provide an overhead draught of air. These gables should face the direction from which the prevailing summer winds blow. The room itself is surrounded by verandahs on three sides. Those on two sides are 7 feet wide, the third (covering the entrance door) is 9 feet wide, and here the motor for driving the separator is placed. Here also are the water-heater, wash-up vats, draining bench, and can-drying racks;

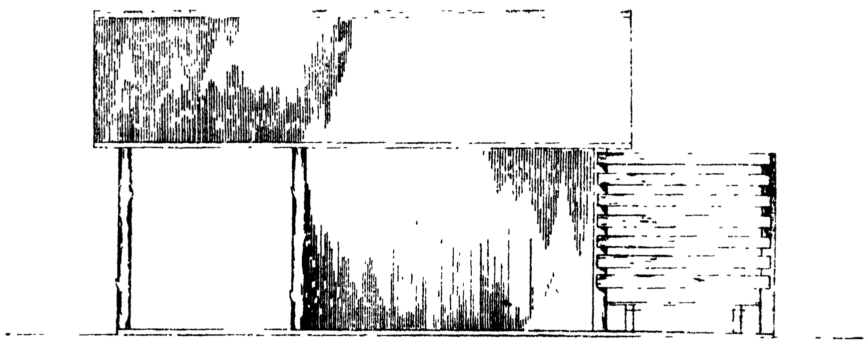


Fig. 16.—End Elevation of Fig. 13.

and at one end a 1,000-gallon water tank is placed on a stand. This verandah can be closed in, so that the motor and utensils as well as those working under it can be protected from the weather. The door to the separator room is fitted with a fly-proof screen, as are also the windows. Provision is made for testing cows for production by placing a Babcock testing machine at one end of the room where a good light can be obtained. The roof should be ceiled (following the contour of the roof) with wood or fibro-cement sheeting, the joints being battened over, if sheeting is used. The walls should be lined. The floors of the separator room and the verandah where the washing up is done should be impervious—concrete brought to a smooth finish is recommended in this regard. This concrete should be raised at least 6 inches all round the walls and bevelled at the intersection with the floors so as to do away with sharp corners and facilitate cleaning. On the dwarf concrete wall the wall plates can be bolted where the walls are to be of wood. The separator should stand on a concrete block which forms part of the floor, the intersection of this block with the floor being bevelled off. The benches

for tester, milk and washing vat, &c., should be supported from the walls where practicable, so as to do away with any impediment to cleaning the floors, but if supports are to be put in (as under the Babcock tester machine) they should be of galvanised water piping set on concrete blocks, bevelled at their intersection with the floor as in the case of the blocks supporting the separator.

Control of Motor and Oil Fumes.

Where oil motors are installed, there is always danger of having the milk or cream adversely affected by absorbed odours and flavours. Machines driven by kerosene are worse in this respect than those driven by benzine, but it is only a degree of taint that divides one from the other. Faults arising from absorbed oil fumes are a frequent cause of second-grade cream, and a means of great financial loss to the dairy-farmer, who receives at least 1½d per lb. less for butter made from such cream.

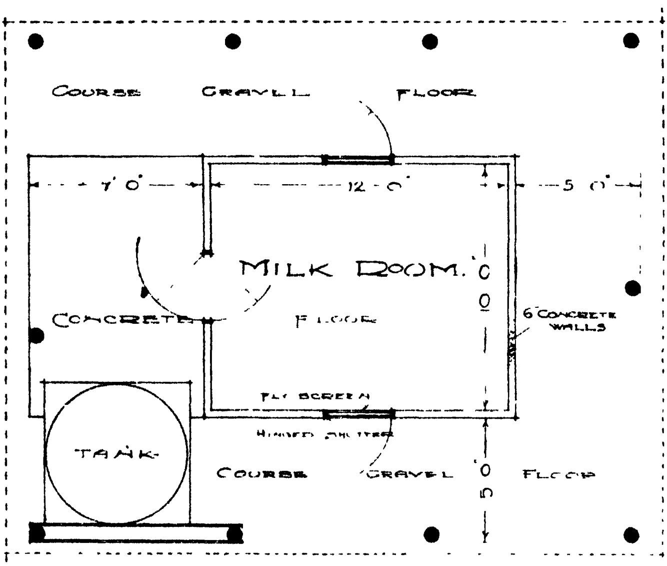


Fig 17 —Plan of Concrete Milk or Cream Room

It is evident, therefore, that every precaution must be taken to avoid any such deterioration taking place. For this reason all oil motors should be placed in a room apart from where the milk vat and separator are situated. The danger arises from—(*a*) fumes coming from the kerosene blow-lamp used, for preliminary heating before starting the motor; (*b*) back-firing, leaking valves and dirty oily engine; and (*c*) the exhaust. The risks from the two first causes are greatly lessened by keeping the motor and separator clean and free from surplus or waste oil and by placing the motor as in Figs. 9 and 13, with a *close* partition between the engine and the milk and cream room. It is advisable to be able to keep an eye on the separator while attending the

motor or *vice versa.* To do this a glass window can be let in the partition, care being taken that it fits closely and is a fixture. For observation purposes also a similar window could be placed in the plan as shown in Fig. 9, in the partition between the separator room and the milking bails, situated, say, 4 feet 6 inches from the floor of the bails; if lower, it should be guarded by strong bars, to avoid being broken by any of the animals, and placed between the entrance door and the milk vat.

Exhaust Fumes from Oil Motors.

The practice on many dairies is to have the motor situated in the separator room; the exhaust pipe is just put through the outer wall, in many cases on the side from which comes the prevailing wind. The result is obvious; the exhaust is blown back through the ventilators and cracks into the separator room, and is absorbed into the milk and cream, with the result that it is

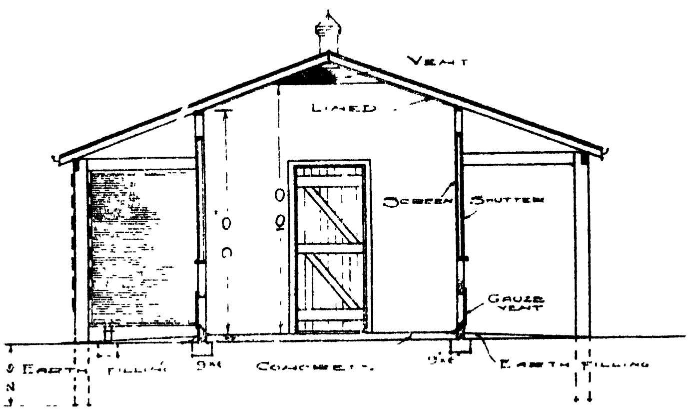


Fig 18 —Cross Section of Fig 17

classified as second grade. The firm that sells the motor puts in the exhaust pipe in this way because it saves the cost of a few feet of extra piping. The farmer accepts the job as satisfactory, and pays for it because he is ignorant of what is to follow in the way of oil-fumed cream. The remedy is simple—*the exhaust pipe must in all cases be carried up well above the eaves of the roof,* so that, no matter from which direction the wind blows, the fumes and oil spray are carried clear of the dairy. At the elbow or bend where the pipe turns upwards to the roof, a small hole can be drilled in the bottom of the pipe to allow any oil, &c., in the exhaust to drip out. Where the roof water from the dairy is conserved, care should be taken that the exhaust does not blow on to the roof; otherwise the water will be tainted from the exhaust oil or petrol. If proper precautions are taken as herein laid down, there should be no second-grade cream from oil fumes and taints.

Cooling and Aerating Milk and Cream.

No dairy is complete unless it has provision for cooling and aerating milk or cream. If such provision were made on every farm, little but a choicest

grade article would reach the factories and milk depots. Some writers recommend the use of concrete tanks in which to stand the milk or cream cans in a water bath, but in New South Wales this plan has not given good results, mainly on account of the supply of water being limited, and the heat during the summer months making the water too warm. Where such tanks are used, there should be a constant stream of cold water passing through, and this is not usually practicable under our conditions. In some cases it has been found that more harm has been done than good, in that the same water has been allowed to stay in the tank for such a long period that it has become slimy and foul.

The method recommended by the Department for cooling and aerating is to use one of the many mechanical coolers that are on the market.

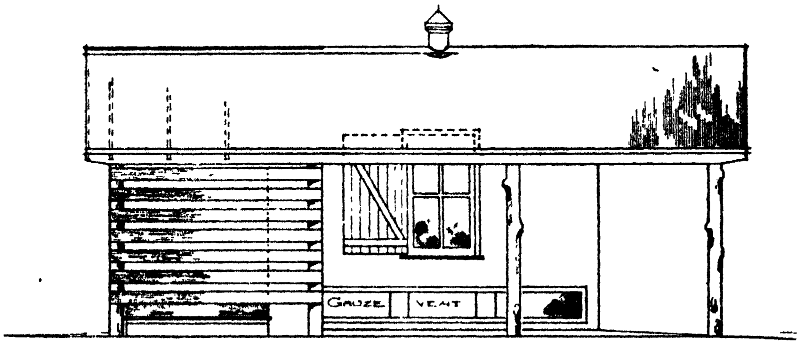


Fig. 19 —Side Elevation of Fig. 17.

In the case of cream this aerating and cooling process could be done as the cream comes from the spout of the separator, and before it falls into the can. Cold water from underground tanks, canvas bags (in dry climates where there is good evaporation), &c., should be circulated through the pipes of the cooler in the hot weather. In winter time it will be found sufficient if the milk or cream is just aerated by running it over the pipes without the aid of water. Aeration enables feedy and animal gases to be got rid of, and is of much benefit to the milk or cream treated.

By cooling down to say 60 deg. Fah. in the summer, milk and cream can be kept in good condition for a longer period and delivered at their destination without deterioration from choicest grade.

Plan for a Milk or Cream Room.

This plan (see Figs. 17 to 19) can be used where the separating is done at the milking sheds, and where, after being separated, the cream is carried from the bails and stored until it is time to send it to the factory. In this plan ample provision is made for coolness, 5-foot verandahs being built on three sides, and a 7-foot verandah on the fourth, the side on which is situated the entrance. The floor of this wider verandah is concreted on account of the traffic; the floors of the others need merely be covered with clean gravel.

The door is a double-swing self-shutting one. Two windows are provided, one of which has a fly-proof screen and a hanging shutter. The ceiling in this room follows the contour of the roof, which is of gable type, the aim being to provide the maximum amount of coolness and ventilation. Ventilation is provided by screened openings in the walls placed just above the floors, and also just under the intersection of the walls with the roof. Fly-proof vents are also provided at each gable end, and a 12-inch cowl in the apex of the roof.

Provision is made for a water tank, which is placed at one corner of the verandah and is boarded in on the sunny side. The floor of the store room is of concrete or other impervious materials, graded to a lead-off drain. Where the walls intersect with the floor, the concrete should be raised 6 inches and bevelled off. Where wood is used for walls the bottom plates should rest upon and be bolted to a dwarf concrete wall.

(*To be continued.*)

THE IDEAL PIGMAN.

IN pig-keeping a good pigman is an extraordinarily important asset. The main thing is to get a man who is intelligent, keenly observant, and thoroughly interested in his work. It is very important that he should observe closely in order to see when pigs are ill or off their food, when sows are in season, and the many other small details which collectively make much difference to the balance-sheet. He should know the individualities of his sows, and if he treats them properly he will be able to handle them quietly. It is a good indication of how a man treats his pigs if he can go up to and handle them in the field, or if they follow him readily when they are called. An intelligent, observant pigman deserves good wages.—W. A. STEWART, in the *Journal of the Ministry of Agriculture*, London.

THE AGRICULTURAL BUREAU CONFERENCE AT PARKES.

THE fourth annual conference of Western District branches of the Agricultural Bureau takes place at the Masonic Hall, Parkes, on 2nd, 3rd, and 4th April. His Excellency the State Governor has been invited to perform the opening ceremony, and the Minister for Agriculture (the Hon. F. A. Chaffey) and many others whose names are prominent in relation to primary production are expected to attend.

The programme forwarded by Mr. Gordon Henderson, hon. secretary of the Conference, discloses numerous items of special interest; among these are addresses on "Diseases of Wheat" (Dr. R. J. Noble), "Fat Lambs and Wheat growing" (Mr. J. Clatworthy), and "Agricultural Co-operation Within the Empire" (Mr. C. C. Crane). A practical demonstration of the possibilities of wireless broadcasting in rural districts has also been arranged, and many important resolutions have been sent along for the deliberation of delegates.

It is urged that all who have an interest in agriculture (irrespective of membership of the Bureau) and who are resident within reach of Parkes should make an effort to be present. Ladies are especially invited.

The use of Calcium Cyanide as an Agent in the Destruction of Rabbits.

MAX HENRY, M.R.C.V.S., B.V.Sc.

FOLLOWING on experiments previously reported,* it was decided to carry out experiments on a larger scale, using both the flake and the powder forms of the material known as "calcium cyanide."

Two paddocks were selected on the bank of the Cudgegong River, one of about 70 acres, and the other somewhat larger. Both paddocks were fairly clear of timber, and were fairly well netted, but some silting up had occurred, and some of the warrens evidently connected up with warrens outside the paddock. The soil was half black alluvial, and the balance rising red country of a sandy nature. Over much of the paddocks was a heavy growth of herbage, which made the locating of the openings difficult. Evidently the paddocks had been very heavily infested in the past season, and at the time of operations many warrens were just being opened up.

Dealing with the material in flake form first, it may be stated that it was found that instead of 1 oz. of material being required to each opening of a burrow, equally satisfactory results were obtained with ½ oz. per opening. Two burrows treated in this way were opened up, and though unfortunately they only contained two rabbits each, all four animals were dead

In all eighty-seven burrows were treated with flake, requiring the stopping of 1,391 openings. With the powder, 162 warrens were treated, requiring the stopping of 2,507 openings. Of these, nine burrows were dug out, and although again the number of rabbits found was low (eleven being the greatest number in any one burrow) all were dead.

To deal with the warren mentioned above, in which eleven dead were found, took approximately 4 oz. of material, and blowing was continued for 2½ minutes.

A week after the work was completed, the Inspector of Stock and the Rabbit Inspector revisited the area, and found that nearly every warren had been re-opened, in practically every case from the outside, so far as could be determined. This applied to both "flake" and "dust" paddocks. Some untreated warrens were found. Judging from the odour emanating from the burrows and the presence of flies, it was evident that many dead rabbits were enclosed.

The results obtained were considered to promise well for this method of rabbit destruction.

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* *Agricultural Gazette*, July, 1923, page 485.

As evidence of the occupation of the warrens and the killing effect of the treatment, nine warrens were dug out with the object of arriving at the toxic effect of the material. Six of these were in the high country, and three in the black alluvial soil.

Among the former, one warren with six openings, using 4½ oz. of calcium cyanide dust, taking 2 minutes to apply, was dug next morning, and contained only one rabbit about the centre of the main run through; this was dead.

Another warren with twenty-three openings, using 5 oz. of dust on the same afternoon, closed in 5 minutes, was dug out next morning, and held only three rabbits, all dead. One of these was in a dead end, and two were in the lower levels in the centre of the warren.

Another warren with eleven openings, using approximately from 5 to 6 oz. of dust (not weighed), taking 3½ minutes to treat, was dug out next morning; it held one rabbit at the intersection of two main runs well in the warren. This was dead.

A fourth warren was treated at midday with approximately 5 oz. of dust. No time for treatment was taken in this instance. Digging was commenced on this 1½ hours after treating, taking four men 3¾ hours. It contained only one rabbit (dead), 3 feet from the surface on a side run.

The other two test warrens dug out in this higher portion had no rabbits, although they showed clear evidence of having been recently occupied. It can be accepted that the rabbits were visiting these warrens each evening from their living quarters in the lower warrens preparatory to occupation.

Dealing with the three test warrens in the black alluvial country, one appeared to be a deep and long-established warren. It had thirty-four openings; was treated for 15 minutes at 9·45 a.m., using 6 oz. of calcium cyanide dust. Digging with four men was started at 11 a.m. the same day, and the digging finished at 2 p.m. the following day—ten hours' work. This warren contained nine rabbits, distributed at various levels, apparently dying where they rested; the deepest one found was at 5 feet from the surface, which was the maximum depth. All were dead.

Another warren with six openings—very large ones, taking 2½ minutes to treat—used approximately 4 oz. of calcium cyanide. The work of digging out was commenced at 10·30 a.m., 50 minutes after treatment, and finished at 3·30 p.m. This held eleven rabbits all dead. Of these four were suckers, found bunched in a dead end, well covered with a fur nest. The balance were well distributed.

The other test warren in the black alluvial soil when dug out contained no rabbits, although there was clear evidence of it having been worked.

A Few General Observations.

In no case was there a live rabbit. No burrows were opened from the inside after treatment, except in one instance. This was a vertical opening, and it looked as if it might have fallen in from the contraction due to the drying out of the soil which was thrown on top of it.

Many openings were covered and invisible owing to the heavy thistle and crowfoot growth, and were only located with the rising dust cloud. The calcium cyanide dust was successful in clearly indicating where these small listening and pop holes were situated at any distance. The dust travelled with considerable speed with the assistance of the blower from one end of the largest warren to the other, one of which had eighty openings, and many others forty and fifty. The average number of openings per warren in the entire paddock was between fourteen and fifteen. Warrens with a few openings on the river bank at times took longer (evidently on account of their depth) to send the dust through than at times did more shallow ones with a greater number of openings on the higher country. From the location of the dead rabbits in the warrens it would appear that calcium cyanide kills very quickly.

It was found desirable to economise the material, using from two to five charge strokes according to the size of the warren, then shutting off and blowing as near as possible air only, and by this means distributing the charge.

With the machine in use it was not possible to shut off completely so as to prevent a certain amount of dust going through at every stroke, and it is thought that to give the most economical results it will be necessary to adapt the machine to give the minimum amount of material, and afterwards practically to pump air for the distribution of the dust already driven into the burrow by the first few strokes.

Although calcium cyanide is of a highly poisonous nature, and immediately gives off gas on exposure to the air, it had no effect whatever on the operator, or on the men closing the openings or digging out, even when the warren was opened up shortly after application.

Warrens in the alluvial country on the average were deeper, with fewer openings, and requiring more material. It was found economical in treating large warrens to blow into more than one opening. From the dead rabbits found in the warrens treated this way, it was evident that the dust had penetrated right through.

Subsequent Report from the Stock Inspector.

A week after the work was completed the Inspector of Stock and the Rabbit Inspector visited the area, and the former submitted the following report:—

"We found that almost without exception at least one opening in every warren treated was re-opened. In many cases the number opened up was greater—two, three, four, and so on—and the greatest number of re-openings counted to one warren was twenty. These conditions applied to both the 'dust' and 'flake' paddocks. With the exception of two or three doubtful, all the openings appeared to have been opened up from the outside. The doubtful ones gave the impression that possibly they may have been scratched out from within.

"In the eastern corner of the 'dust' paddock, we discovered one large 'working warren' with fifteen openings, which had been missed in the

experiments, and we also discovered a number of other openings throughout the two paddocks that had been missed, being hidden by thistles and thick herbage. The large warren mentioned appeared to have a fair number of rabbits in it, and possibly it was the rabbits in this and other warrens that re-opened the majority of the treated warrens.

"We made a careful and close inspection of many of the re-openings in the treated burrows, and from the number of blow-flies flying in and out of these openings, and by the smell emanating from within, it was very evident that many of the rabbits that were enclosed were dead before the burrows were re-opened.

"These conditions apply to both the burrows treated by the flakes and those treated by the dust."

Later Confirmation.

Since the above experiments, further work has been carried out at Mudgee, and in the north-west, and the results obtained confirm the opinion previously formed that the use of this material offers considerable promise for the destruction of rabbits.

It would appear probable that the use of dust or powder with a blowing machine would economise material and time, but two men are required, and a machine must be purchased. The use of flakes requires more material, though evidently not half as much as was used at first, and one man can carry out his own work, and going steadily could cope with a number of burrows. Where large areas have to be cleared up and labour is available the powder is to be preferred, while for men on small holdings who do their own work—and that at irregular intervals and times, fitting it in with other farm work—the flakes would probably be cheaper in the long run.

So far as effectiveness goes, there appears to be no appreciable difference. The gas would be given off quicker by the powder, but would continue to be given off for a longer period by the flakes.

As regards the rapidity of the gas as a killing agent, it may be mentioned that a rabbit enclosed in a box with a content of 12 cubic feet, was killed in four minutes by one thirty-second of an ounce of powder blown in through a small opening.

The work confirmed the previous good opinion formed as to the penetrating power of the gas.

A CORRESPONDENT who had 20 acres of broom millet which had attained a height of 4 feet and then commenced to wither off very quickly owing to insufficient rain, wished to be informed if the crop (in a dying-off or any other stage) was harmful as a feed for stock.

The writer was informed that while no cases of poisoning had been reported, the feeding of broom millet could not be recommended as being free from risk. The broom millet plant was of the sorghum species, and as such must be treated with caution. The crop should have a utility as feed, however, if cut and allowed to wilt still further, or made into silage for future use.—A. J. PINN, Special Agricultural Instructor.

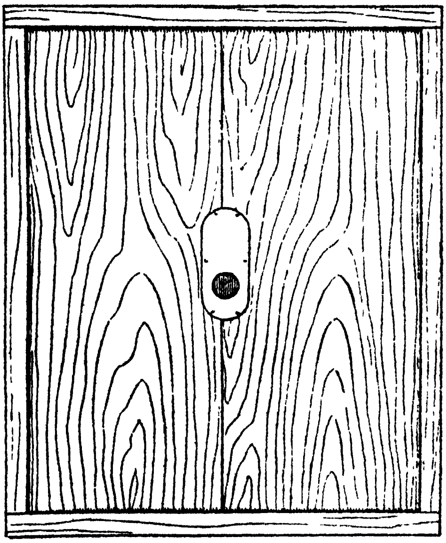
The Production of Comb Honey.

[Concluded from page 63.]

W. A. GOODACRE, Senior Apiary Instructor.

THE manipulation of the supers as described last month is a most desirable method to use to obtain a maximum production of honey: moreover, as a free avenue for work is provided in the supers to minimise congestion of both bees and honey in the brood chamber, the procedure tends to reduce any inclination to swarming, which is an important point for consideration when producing comb honey.

If swarming does occur, it is advisable to return the bees to their own stand, for a division of the colony during the honey flow is undesirable. The swarm may be hived in the usual way in a new brood chamber on frames containing full sheets of comb-foundation, and for additional inducement a comb containing a little brood may be used. The old brood chamber is removed and the new one containing the swarm is substituted. To get all the working force of the old colony with the swarm, the bees from the brood combs of the old brood chamber are shaken in front of the swarm colony, and the brood, after removal of the queen cells, may be distributed among the weaker stocks able to care for it. If the wings of the queen are clipped when swarming occurs, the combs of brood only in the old brood chamber need be removed while the swarm is flying, and the frames of foundation substituted. The swarm returns to find an empty brood chamber, and should go readily to work. The original supers in each case are not altered in position. To forestall swarming when advanced queen cells are observed, the colony may be artificially swarmed by exchanging the old brood chamber or frames for empty ones, and shaking all the bees from the old brood combs and allowing them to enter the empty brood chamber.



Bee Escape Board for removing Bees from supers.

[*After Phillips.*

Removing Supers of Sections.

The supers of sections, when completed, are removed intact, for it is not practicable to remove the sections individually, especially when production

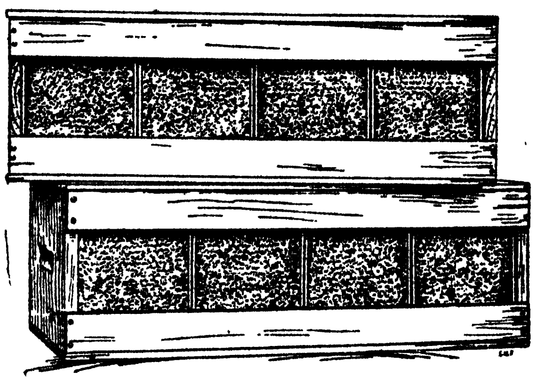
reaches a commercial stage. The bees may be removed by a judicious use of the smoker and slight dumping of the end of the super on the ground in front of the hive, or by the use of a bee escape board (see accompanying figure). The bee escape board, while very useful during a honey flow, is specially desirable for use at the close of the flow, when robbing may be induced by any open methods. The escape board is placed under the super or supers to be removed and left overnight; the bees may pass down into the body of the hive, but no re-entry can be effected.

Care of Comb Honey in Store.

The supers of comb honey are piled in the honey room, a free circulation of air being allowed through the sections. It is a good practice to place the piles of supers on blocks, and have a wire cloth screen top and bottom. A dry atmospheric condition is necessary, for comb honey will absorb moisture, and its appearance and quality are liable to deterioration. During dry days allow plenty of ventilation in the honey room. During damp weather the use of artificial heat is desirable.

Preparing Sections for Market.

The sections of comb honey to be disposed of are removed, cleaned of propolis, and classified according to their quality Where transport has to be considered in marketing, special care should be taken in packing. The illustration gives a good idea as to the method of packing. Each crate holds twenty-four sections.



Shipping Cases for Comb-honey. [*After Phillips.*

The local market should be worked to its full capacity; sections just below the shipping standard can frequently be disposed of in the local field at a payable price. Partly filled sections and those below market standard may be used to feed bees during spring, and after being cleaned up in this way may be put aside for use later as bait sections.

Irrigation Farming in New South Wales.

Miscellaneous Crops.

(Concluded from Vol. XXXIV, page 846.)

A. N. SHEPHERD, Senior Agricultural Instructor.

The last two articles of this series have been devoted to the crops that can be raised on irrigation lands for the feeding of stock. No discussion of farming on these lines would be complete without reference to lucerne—that most valuable of all such crops—but in view of the ample treatment afforded it by Messrs. Chomley and Chaffey in this Gazette in 1921, it is not proposed to deal with it here. The subject of fodder crops may therefore be regarded as covered for the present.

Before turning to crops of other kinds, however, it may be remarked that the growth of fodder must ever be a prominent feature of irrigation farming, and especially so in New South Wales, where the only limitation to the carrying capacity of much excellent land is the scanty rainfall. With the aid of a small area artificially watered, it is possible so to increase the carrying capacity of many dairy-farms, and even of many small stations, as to double the profits per annum. It does not require any prophetic vision, therefore, to anticipate that the day is coming when far greater advantage will be taken of the resources of the country in this respect, and when every acre that can be commanded by water will be made to contribute far beyond its grazing capacity to an increase in the animal products of the State.

Of non-fodder crops (if such an expression is permissible) the number and variety that can be grown in this State is great indeed, but it is proposed to limit the present discussion to those that are already grown on a commercial scale, or that may be regarded as likely to command attention soon. Certain of these (notably rice and cotton) have been dealt with in other articles so recently that it is not proposed to go over the ground again here.

Maize for Grain.

In addition to the utility of maize for fodder—to which reference was made in the last article of this series—the irrigation farmer cannot afford to overlook the profits that attach to a well-cultivated crop grown for the grain.

The preparation of the ground should be on the same lines as in the case of the fodder crop, but it should be thorough, and it should be begun early. The seed may be sown at the rate of 10 lb. to the acre in rows 3 feet apart, and three grains in hills at every 2 feet to 2 feet 6 inches. Planting,

which can be done either with the corn dropper or by hand, should be carried out in the first week of December in order that tasselling time may not coincide with the hot, drying winds of midsummer.

The crops should receive good inter-cultivation, and unless rain occurs it will be found necessary to water frequently—almost every fortnight—using inter-row furrows. The cultivation can be dispensed with when the crop has attained a sufficient height to protect the ground. Only early-maturing varieties should be used, Iowa Silvermine and Funk's Yellow Dent being about the best for the purpose.

Potatoes.

Larger crops of potatoes might well be grown under irrigation in this State, and particularly the production on the Murrumbidgee Irrigation Areas might be much greater than it is. Apart altogether from the production of the tubers for sale in more distant markets, there is a considerable population on and around the Areas which must require goodly quantities of this popular form of food, and there is no reason why the tablelands and even other States should be drawn upon for supplies when facilities for producing the crop exist at hand. There seems to be an assured and reasonably profitable market for Yanco and Griffith settlers.

Only the better-class soils should be used in the growing of potatoes, the sandy, loose-textured ones being specially adapted for the purpose. A good fallow, fairly lengthy and well cultivated, is absolutely necessary. That new land, if available, is always preferable goes without saying.

For the spring crop the land should be ploughed at least 6 inches deep early in the winter, and well worked down by the end of July, so as to be ready for the seed to be planted in August.

A planting may also be made in the month of January, or the beginning of February, the preparation of the land for which should again be begun early to ensure a good seed-bed. The autumn planting is not as extensive as it might be, one difficulty being the scarcity of seed at that time, but it is worth more attention than it receives.

Several methods of sowing are practised. A common one consists of striking out furrows every 3 feet, and then dropping the sets by hand every 15 to 18 inches apart in the rows. In other cases the land is ploughed and the potatoes placed in every third or fourth furrow, according to the width of the furrow, so as to give the same distance between rows and sets as above.

If manure is to be used, it is usual to apply up to 2 cwt. per acre of superphosphate, either the manure box on the maize dropper or the hand being employed to place it in the furrows with the sets. The fertiliser mixture P9 (which consists of ten parts superphosphate, three parts chloride of potash, and three parts sulphate of ammonia) has also given good results,

2¼ cwt. per acre being used. The mixture P7 (equal parts of superphosphate and bonedust) at 2 cwt. per acre has also justified its use and might be tried by farmers. The seed and fertiliser should be covered in with the harrow.

For the spring sowing the seed tubers may be cut without harmful results if they are on the large side, but for the autumn planting whole seed is preferable, as cut sets dry out in the hot ground. The spring planting may also be rather shallower than is advisable in the autumn, it being necessary in the latter case to put the sets down in cool, moist soil, provided, of course, that it is not too deep. It is advisable to sprout the seed, as that pushes the plant along quicker from the very beginning

If the land appears to be caking on the surface, after the young plants have appeared, it is good practice to run a harrow over the crop. This not only breaks any crust that is forming, but it also destroys weed seedlings. The inter-cultivation should be frequent, but becoming shallower and not quite so close up as the plants grow. Hilling-up, which is advisable, can be carried out by means of a cultivator fitted with hilling attachments.

Under no circumstances should a potato crop be allowed to suffer from want of water. The best method is to water a little and often, and to make the application in the cool of the afternoon or evening, or on a cloudy day. If the opportunity of watering on a dull day offers itself it should be taken, even though the crop could have carried on for a few days without it.

Furrow irrigation is, of course, the only practicable method of application, and after each watering the land should be cultivated with the scuffler with the hilling attachment

In light soils the length of the furrow along which the water is run should not exceed 3 chains. The water should be put on with a good head, so that the crop shall be watered quickly. If water is allowed to lie for any length of time the potatoes will very soon scald and die.

The importance of keeping the crop growing from first to last cannot be exaggerated in connection with potatoes. If irrigation is neglected after the tubers have been formed, it will be found that they begin to mature, and should water then be applied " second growth " will result The advice, therefore, must be to keep the tubers going without check

Harvesting is usually carried out by hand on the Murrumbidgee, as the Areas are not large enough to justify the purchase of a mechanical digger. The potatoes grown on the Areas are chiefly for home or local consumption, and the time for digging is thus governed in a measure by local requirements and by the size of the tubers. As immature potatoes do not keep well, the farmer who has any appreciable area should arrange for the sale of his crop before he digs it.

Peanuts.

Though not a crop of major importance, peanuts may very profitably engage some of the attention of the irrigation farmer. In itself the plant is

a very valuable soil renovator, and decidedly useful as fodder, especially perhaps for pigs, but there is also the confectionery trade, and there are the peanut oils and other products of the nut which already represent many millions of dollars annually in the United States, and which are beginning to receive attention from manufacturers in this country. Australia might well be growing all its own requirements and even exporting a surplus, and growers have the advantage of the protection of a substantial tariff wall.

Peanuts should be grown on the lighter class of soils, as the nuts (which are formed under the soil surface) must have room for expansion. The preparation should be deep, affording the plants 5 or 6 inches of worked soil, and the sowing should be made in the middle of October in drills 2 ft. 6 in. to 3 feet apart, and with 12 to 24 inches between the seeds, according to variety. The variety known as Local is of spreading vegetative habit, and requires a good deal more space than Spanish, which is the smallest plant of those grown here. Valencia comes between the two.

The water must be applied in furrows, the interval between waterings at the early part of the season being about a month, but in the hot weather of midsummer and early autumn it should be about a fortnight, the object being to keep the crop growing with frequent judicious waterings. The water must be so managed that it does not lie long on the crop, and toward the end of the season the effort must be to encourage the plants to mature in March, otherwise a series of nuts will be set until it is so late in the season that the bulk of the crop may be damaged by waterings which are intended to mature the late crops.

Vegetable Crops.

One of the surprises of farm life in this country is the limited extent to which farmers grow vegetables for their own consumption. Admitting, as we well may, the discouragements that are likely to be experienced in our drier districts, the remark is applicable even to portions of the State where rainfall and soil conditions are distinctly favourable. Even where water is available for the irrigation of a vegetable allotment, the opportunity to produce on the farm a substantial proportion of the food of the household in a form which, for freshness and attractiveness, would be the envy of many a family less favourably situated, is not availed of to the extent it might be. This is scarcely less true of settlers on the Murrumbidgee Irrigation Areas than of those elsewhere who own patches of alluvial land that could easily be served with river water. A few suggestions as to the use of irrigation water for this class of crop may encourage some to take advantage of their opportunities.

On the Murrumbidgee Irrigation Areas there is ample scope for the development of a regular vegetable growing industry. At present vegetables are

mainly grown in the spring and autumn, so that opportunities offer themselves to men who can produce some of the popular edibles in the hotter months.

Irrigation, especially overhead irrigation, seems to suit vegetables particularly well. They require plenty of moisture below, but they do far better if occasionally the water is sprayed on. Hence, one of the overhead irrigation systems is likely to prove a profitable installation in this connection.

Speaking generally, it is the lighter classes of soil, well supplied with humus, that on the whole are most suitable for vegetable growing, and particularly for the smaller and tap-rooted vegetables. The preparation of the soil should be deep and thorough, and it should be well in advance of sowing in order that ample time may be allowed for the elaboration of plant-foods under the most favourable conditions.

Cucurbits.—Of the many vegetables that lend themselves to growth under irrigation, the pumpkin, marrow, and melon may well be mentioned first. The seed should be sown in October and November, four furrows being thrown up, and the seeds planted on the crown, about three or four seeds every 8 or 10 feet, and the rows about 10 feet apart. The irrigation water can be allowed to run down the furrows on either side of the plants, and a thorough soaking can thus be ensured. When the plants have made good growth, another furrow can be backed against the first furrows, and the new furrow thus formed can be used as a permanent irrigation furrow during the life of the crop. The applications of water should be continued until about the end of March, and the plants then allowed to mature.

Pumpkins grow particularly well on the Murrumbidgee Irrigation Areas. Triamble is the best variety for the district, though Crown, Button, and Ironbark are all suitable, and are grown by some.

Well-known varieties of grammas, squashes, and marrows may also be grown with profit. Of water melons, Tom Watson and Chilian are good varieties, and rock melons, cassavas, and cantaloupes also offer satisfactory returns. The treatment is the same as above, but the plants can be set closer together, and preferably on the flat. It is not worth while sowing any of the melons too early on the Areas.

Cucumbers also should be sown on the flat, and, of course, closer together.

Superphosphate should be used with the seed of all these varieties, being of material advantage in establishing the young plants.

Cauliflowers and Cabbages.—Seeds of these useful vegetables may be sown in prepared beds in December and onwards. Early varieties should be planted out in February, and plantings may be continued until the main crop is put out in April. Late plantings do not usually do much good on the Areas.

In setting out the plants, the early ones can be placed about 3 feet apart in rows, and about 18 inches apart in the drills. The later sorts, being of larger growth, should be given more space, the rows being 3 ft. 6 in. and the plants 2 feet to 2 ft. 6 in. in the rows.

With the exception of the early varieties, the crop does not require a great deal of irrigation, and the treatment should, as far as possible, be similar to that given to cabbages under ordinary conditions. In planting the early sorts, a drill should be struck, the plants set in the side of it, and then a stream of water run down the furrow. This method has been found well worth following, good strikes being obtained by it. It sets the soil, waters the plants, and gives the crop a good start.

The number of varieties is very great and new ones are frequently coming forward, but of cabbages Drumhead and St. John's Day (for early sowing) and Succession (for the main crop) may be mentioned, and of cauliflowers Veitch's Autumn Giant is a good main crop variety, as is Eclipse, while Snow Queen is a good early variety.

Tap-rooted Vegetables.—Of these there is a goodly variety that can be grown with profit under irrigation conditions. Turnips, beets, parsnips, carrots, &c., are generally sown about March, and only sufficient water should be applied to keep them growing. During the winter it should not be necessary to irrigate, and the crop will be harvested in, say, July, August, and September.

Tomatoes.—The area devoted to this crop on the Murrumbidgee should be much larger than it is, for the conditions should be distinctly suitable, and the crop is likely to suffer from few of the troubles that beset the grower in coastal and tableland districts. The market in the south-western portion of the State requires some development, and any grower who contemplated sowing a fair area should ensure an outlet for his crop.

For early crops the seed should be sown in hot-beds in June, and the seedlings presently transplanted into paper pots or open tins, and protected from the weather for a while. They should then be gradually hardened off and planted out in sheltered positions in September and October. To hasten fruiting the plants should be pruned by the removal of the side shoots, and the main stalk should be tied to a stake to its full height. The picking of this crop starts in November and December.

The main crop should be planted out in October and November, and will be ready for picking from the end of January onwards. The irrigation of this crop is a matter of practise, as it is with a good many others, but the water should be supplied in plenty by furrows, and in the hotter months weekly waterings are essential to the best results.

A number of varieties may be mentioned as profitable, but Spark's Earliana, Chalk's Early Jewel, Burwood Prize, San José Canner, and Ponderosa are about the best.

Insect Pests of Cotton in New South Wales.

[Continued from page 55.]

W. B. GURNEY, F.E.S., Government Entomologist.

The Coon Bug (*Oxycarenus luctuosus*, Montrz.).

THIS indigenous species has a wide range in Australia and occurs also in New Caledonia. There is an allied species, *Oxycarenus arctatus*, by Walker, recorded by Hill as a minor cotton pest in the neighbourhood of Port Darwin. Hill records this species as laying eggs in small clusters on the lint, frequently in the prematurely opened bolls already damaged by the boll worm (*Earias huegli*). These eggs hatch in about three days, and the young and adults feed and shelter in the bolls and among the withered bracts, feeding upon the seed and soiling the lint with their excrement. From time of hatching to the adult stage occupies eighteen to twenty-five days.

Control.- The life history of *O. luctuosus* is similar to the allied species previously referred to, and control measures for both these species would, in the first instance, be clean cultivation, destruction of weeds that harbour the bugs, and the collection and destruction of infested and worthless bolls. As a last resort the use of a shallow tray of thin tar or else of oil and water drawn along between the rows while the plants are brushed over it as it passes may be necessary, as suggested for severe infestations of the Rutherglen bug.

The Red Cotton Bug (*Dysdercus cingulatus*, Fabr.).

This species is recorded by Hill as a pest of cotton of considerable importance in the Northern Territory The adult bug is of a reddish colour on the under-surface and rather yellowish above, the membrane of the wings being black. Its food-plants are cotton and various introduced weeds, including *Cida cordifolia*.

Life History.- The eggs are oval and yellowish-white, and are laid on the under-surface of the leaves, in the bracts and open bolls. Hill records that fifty to ninety eggs may be laid by a single adult. These eggs hatch in from eight to eleven days, and after passing through five stages, the insects reach the mature winged stage in from sixty-two to seventy-eight days.

Damage.—These insects suck the sap, the greatest damage being done to the young bolls and ripening seeds. Severely attacked bolls may open or fall off prematurely; also the lint is stained, either by excrement or by the crushing of the young bugs during picking or ginning.

Control.—The methods of control are the same as for Rutherglen bug and the Coon bug.

The Cotton Stainer Bug (*Dysdercus sidæ*, **Montrz.**).

This bug is common, and, distributed widely over New South Wales, Queensland, and the Northern Territory. It was first described from Australia in 1861. Its food-plants are weeds and vegetable and field crops, including cotton. It is recorded from the wilga (*Geiiera parviflora*).

Description and Life History.—The adult is of a general reddish-fawn colour, with a red head, a whitish transverse strip behind the head, and single, small definite black spot on each of the front wings; the gauzy portion of these wings are smoky-brown. The immature stages are wingless and red in colour. The life history of this bug is similar to that of the Red cotton bug (*Dysdercus cingulatus*). The habits of the two are also similar and the damage done by them in their various stages; that is, the damage done is mainly to the bolls and lint. So far, however, this bug is a minor pest.

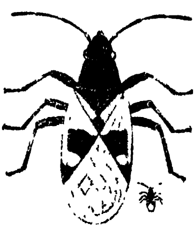


Fig 15 Coon Bug (*Oxycarenus luctuosus*).

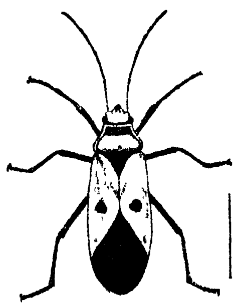


Fig. 16—Cotton Stainer Bug (*Dysdercus sidæ*).

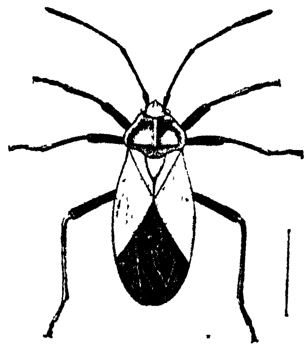


Fig 17—Parti-coloured Cotton Bug (*Oncopeltus quadriguttatus*).

[*After Froggatt.*

Control.—The methods advocated for Rutherglen and Coon bugs are recommended for control.

The Parti-coloured Cotton Bug (*Oncopeltus quadriguttatus*, Fabr.).

This species has a wide distribution throughout New South Wales and Queensland, and was recorded by Froggatt in 1897 as present in all stages of development, from the eggs to the adult, upon cotton plants at Wollongbar, on the Richmond River He recorded the round eggs attached in a broad and circling band of some dozens of eggs. The immature bugs are bright red, and the adult bug measures about half an inch in length; the head and thorax are a dark, smoky-red, the base of the wings reddish-yellow, and the gauzy portion black. The habits, behaviour, and development of this species are somewhat similar to those of the Red cotton bug previously described. Little damage has so far been recorded as the result of its presence.

(*To be continued.*)

The Queen Bee Competition at Wauchope.

W. A. GOODACRE, Senior Apiary Instructor.

IN the selection of breeding stock, a consideration of much importance to the apiarist is the building-up capacity of a colony, for colonies that are able to build up a large force of bees are usually in the best condition to take advantage of a honey flow when it occurs. There are other advantages, too, such as the increase to be gained from the advanced stocks.

In this building-up work the queen bee plays a most important part. To be successful she must go about her egg-laying in a methodical way, and be prepared, as the population increases, to lay a very large number of eggs—probably up to several thousand per day. Something also depends upon the attention paid to her by her progeny, and the manner in which they make provision for expansion, feeding, and incubation of the brood A queen bee without method in her work, laying indiscriminately about the brood nest, wastes much time looking for empty cells, and doubtless also causes much inconvenience to the nurse bees in their work of feeding and attending to the scattered larvae.

In the Queen Bee Competition which was commenced at the Government Apiary at Wauchope last December, six colonies have been awarded 90 points and over. In the brood chamber of these colonies there is evidence of some wonderfully good work—nicely packed sealed brood, well-formed brood nests, and a large force of young bees in the hives. Considering that the queens had a long mail journey previous to introduction, and many adverse conditions to contend with in the fields after their establishment, their work in this test has been of a very high order.

Reviewing the points awarded for building-up work following the wintering qualification test, we find Mr. G. G. Phillips' group, which won second place for wintering, to be leading. In the individual test for this qualification, Mr. G. James' queen No. 6, which won the second highest points for wintering, occupies first place. Mr. F. Coleman's queen No. 11 is principally responsible for the loss of points in his group. It is surprising to note the gain of Mr. L. Smart's group in this test. After rather a low award for wintering, the colonies have done so well in their building up work as to get within two points of the leading group

The points awarded for building-up qualities (maximum 100) are as follows :—

G. G. Phillips.—No. 16, 94; No. 17, 84; No. 18, 92; total, 270 points.

L. Smart.—No. 13, 86; No. 14, 87; No. 15, 95; total, 268 points.

E. J. Gibbs.—No. 1, 90; No. 2, 70; No. 3, 94; total, 254 points.

G. James.—No. 4, 70; No. 5, 84; No. 6, 96; total, 250 points.

F. Coleman.—No. 10, 80; No 11, 70; No. 12, 94; total, 244 points.

Cushan Bros.—No. 7, 60; No. 8, 70; No. 9, 86; total, 216 points.

"INTENSIVE FARMING."

THE problem of the feeding of the increasing population of the globe has hitherto been solved by the occupation of areas yet undeveloped; but in the closely peopled lands of the northern hemisphere the time is coming when additional areas will no longer be available, and, in any case, will only be profitably available for the class of crop that can be carried in great bulk over long distances. Intensive culture is thus being forced upon men, the more so as in almost every land the increase in population is so largely an increase of urban residents, and as there is a valuable class of food that must be produced in proximity to the great manufacturing and transporting centres.

This little book of 144 pages is occupied with these crops, and its object is to show how they may be produced in great bulk from small areas. Onions, celery, frame culture, and fruits come within its scope. Interesting chapters are devoted to the forcing of vegetables, the breeding of plants for purposes of intensive culture, seed-growing, and the management of the nursery, while irrigation and the relation of animals to the problem are duly discussed.

The writer, Mr. L. C. Corbett, has presented his information in the simplest terms, and with a suggestive contact with the economic aspect of the subject.

Published by the Macmillan Company, New York, from whom our copy

DISTILLATION OF OIL FROM EUCALYPTUS LEAVES.

THE following information was supplied to a correspondent who inquired as to the method of making phellandrene oil :—

To collect and treat eucalyptus leaves for the purpose of extracting their oil it is necessary to obtain a special license, under the Forestry Act, from the Forestry Commission. For the production of phellandrene oil, *E. phellandra, E. radiata,* and *E. consideniana* are suitable. Various forms of distilling apparatus are available; for convenience and portability the usual 400-gallon ship tank, direct fired, is most suitable for anyone working in a small way, but greater efficiency is obtained if a fire-box is built under the distillation tank. The tanks are frequently run in pairs. They are provided with lids which clamp tight, and a pipe leads from near the tops for removal of the heated vapours to a suitable receiver.

When the tank has been suitably erected, a grating is placed in it 8 inches from the bottom, and on this the leaves lie. About 100 gallons of water are added and the tank is filled up with leaves (about 800 lb.) The lid is placed in position, lagged with mud, and securely clamped. The fire is lighted at the commencement of packing, and by the time the tank is filled it commences to get warm. Steam is then raised and distillation commenced, the oil and steam being condensed in the pipe leading to the receivers. Distillation is continued until no more oil comes over, and at the end of the operation there should be about 6 inches of water in the tank. Full details and working plans will be found in Bulletin No. 4, "Guide to the Extraction of Eucalyptus Oil in the Field," by A R. Penfold, Technological Museum (1922), which has been issued for the purpose of assisting those contemplating the distilling of eucalyptus leaves for their essential oil.—A. A. RAMSAY, Chemist.

Orchard Notes.

FEBRUARY.

W. J. ALLEN and W. LE GAY BRERETON.

THE sowing of crops intended for ploughing in should only be done with discretion. In localities where the rainfall is scanty and barely sufficient to raise a crop of fruit, as in many of our inland districts, it is unwise to attempt this practice, though during a run of abnormally wet seasons, when frequent useful rains during the summer have supplied sufficient moisture for the trees' requirements without the moisture reserves in the subsoil being depleted, a risk may be taken and a crop raised for green manure. This should be turned under early in the winter so that as much as possible of the winter rains may be stored for the requirements of the trees. Unfortunately such conditions are rare this season, and even where the rainfall is generally ample the subsoil will be found to contain only a very small supply of reserve moisture. Under these circumstances the wiser plan is to forego a cover crop for green manuring, and to keep the land in condition so that it will absorb as much as possible of any rain that falls.

Harvesting.

The later canning and drying varieties of peaches will be coming in this month, as also the later varieties of plums. The first of the prunes, sultanas, and Gordo Blanco grapes are also generally fit for drying during the latter part of this month. Like all fruit for drying, these should be thoroughly ripe. Prunes should not be gathered until they drop, and grapes for raisins should not be cut until they are quite sweet; indeed they should be allowed to hang a week or more after they are fit to eat.

During this month the busiest time of the harvest starts for the apple and pear grower of the tablelands and inland districts. The exporter, owing to the necessity of booking space ahead, is obliged to pick to a pre-arranged time-table, and owing to the difficulty of exactly predicting the time fruit will be fit, and estimating the quantity the trees are carrying, it often happens, especially during the first shipments of the season, that fruit is picked before its time to avoid paying for empty space. Although no one advocates shipping immature fruit, it seems unavoidable to some extent, as the export season is comparatively short.

At the same time, if the competition from American stored apples that occurred last year is going to continue, it is going to be just as unprofitable to send over early immature apples as it is to try and extend the tail-end of the season, and meet the early new season's fruits from the continent. As there are now so many new apple and pear growers, it may be advisable to repeat the hints on picking that have appeared in these notes before.

With most varieties of these fruits it is necessary to go over the trees more than once, as they do not all mature at the one time, and the earlier specimens on a tree will not hang until the later ones on the same tree are fit.

In picking some of the earlier varieties of pears, such as Williams, which will ripen even when picked very green, or some of the earlier apples as cookers, it is usual and quite satisfactory to pick as soon as the fruit has attained a saleable size. But in dealing with the later varieties, maturity must be taken into consideration. There are several indications by which this can be judged, and a decision should be arrived at by observing each. The browning of the pips, for instance, cannot be relied upon by itself, but the condition of the flesh must also be taken into consideration. The flesh when cut or bitten should have lost its woody texture, and show some juiciness. When tasted there should be an indication of the sweetness and flavour (though, of course, not fully developed) characteristic of the variety when ripe. Coloured varieties should hang, if possible, till their colour develops sufficiently.

But the indication which has most influence in forming a decision as to when to pick is the readiness with which the stalk parts at its union with the spur. Naturally, if one delays picking after this condition prevails, there is great risk of heavy loss from wind. Ability to judge the condition when to pick is very easy to acquire, and one soon gets familiar with the varieties one is handling. But caution must be exercised in not trying to generalise too much. For instance, it has already been mentioned that Williams pears may be picked very green if the price and market warrant. Josephine de Malines and Packham's Triumph, on the other hand, must be allowed to hang until well matured, or they will not ripen well after picking.

It is not wise in some districts to wait for colour in McIntosh Red, as this apple will fall before developing it, and if one wishes to leave the fruit as long as possible to colour, the trees should be mulched with straw or dried grass and the fallen fruit picked up daily.

Delicious must be allowed to hang till well matured on the tree, or its texture will remain woody and unpalatable. This apple hangs well, and the early specimens can often be allowed to hang till the later ones on the same tree are fit to pick.

Pests.

It has been pointed out that February is the start of the busy harvest time for the apple and pear grower. However, he must still find time to combat the moth by seeing that all infected fruit is regularly collected and destroyed by boiling, and by ensuring that no fresh infection is introduced in second-hand or returned cases. It is certainly a feature of fruitgrowing that during a great part of the year there are several jobs that cannot be delayed without loss calling for attention simultaneously.

Although some of our citrus districts have benefited by the rains in January, at time of writing many trees are still weak, and it looks very much like a repetition of last year, when spraying had to be delayed until too late. In such cases an endeavour should be made to fumigate, as this method is effective in killing scale in a more advanced stage than spraying.*

Budding.

If it be desired to change the variety of any tree in the orchard, it is not too late to bud these and also nursery stock, provided the sap is running freely. The scions should be only taken from trees that have proved to be consistent croppers of a good type of the desired variety.

* Since the above was written many coastal districts have had further copious rains that should quickly put citrus trees in condition for either spraying or fumigating for scale pests.—W. J. ALLEN.

"ROPY" CREAM.

RECENTLY the dairy instructor in one of the South Coast districts was called upon for assistance in the investigation of two cases of "ropy" cream. His efforts in each case resulted in the determination of the cause and the suggestion of a remedy.

In one case one of the most progressive and careful dairymen in the district was in trouble. The instructor took with him the whole of his bacteriological outfit and examined samples of the milk of all the cows in the milking yard individually, as well as a number of samples of water from the cows' various drinking supplies. The water used for washing-up purposes was also examined. The milk of sixteen of the cows showed the presence of the organism causing ropiness, and one of the sources of drinking water also contained the organism. The cows were then kept away from this water for a week, and a further examination was made of each animal's milk. None of the milk of any of the cows originally affected now showed the presence of ropiness, but the cream was still very ropy.

The dairy utensils were then closely examined, and it was found that infection was present in the benzine tins used in the dairy for holding the cream from each separation. The seams in the tins had not been soldered smooth, and the organism was traced to the small amount of matter held in these seams. Fresh benzine tins were obtained, and all the seams were carefully soldered smooth. The use of the new tins, together with the cutting off of the affected water supply, immediately brought about the production of a sound, choice cream.

The cows had evidently in the first instance brought in the infection on their udders from the affected water, and the mischief was accentuated in the dairy by the unsuitable vessels used for holding the cream. This once more shows the importance of flush-soldering the seams of all benzine or kerosene tins used for holding milk and cream.

The second case of ropiness was similarly traced to an affected water-hole used for drinking purposes. A very careful washing of the cows' udders and teats prior to milking, together with the cutting out of the bad water supply, had the desired effect. No benzine tins were in use at this dairy.—O. C. BALLHAUSEN, Assistant Dairy Expert.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat:—

Aussie	Manager, Wagga Experiment Farm, Bomen.
Canberra	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Cowra.
	Manager, Wagga Experiment Farm, Bomen.
	J. Haggart, Warre Warral.
	T. R. Jones, Birdwood, Marsden Road, Forbes.
	W. W. Watson, Woodbine, Tichborne.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	J. W. Eade, Eade Vale, Euchareena.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
Clarendon	Manager, Experiment Farm, Glen Innes
	J. W. Eade, Eade Vale, Euchareena.
	Mrs. J. D. Berney, Kildara, Cumnock.
Cleveland	Manager, Experiment Farm, Bathurst.
	J. W. Eade, Eade Vale, Euchareena
Currawa	Manager, Experiment Farm, Temora.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
	J. W. Eade, Eade Vale, Euchareena
Early Bird	Manager, Wagga Experiment Farm, Bomen.
Federation	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	P. Corcoran, Weerona, Moombooldool.
Firbank	Manager, Wagga Experiment Farm, Bomen
	J. W. Eade, Eade Vale, Euchareena.
Florence	Manager, Experiment Farm, Glen Innes.
	T. R. Jones, Birdwood, Marsden Road, Forbes.
	Mrs. J. D. Berney, Kildara, Cumnock.
Genoa	Manager, Experiment Farm, Glen Innes.
Gresley	Manager, Experiment Farm, Bathurst.
	E. J. Allen, Gregra
	W. W. Watson, Woodbine, Tichborne.
	J. W. Eade, Eade Vale, Euchareena.
	T. J. A. Fitzpatrick, Erin Vale, Warre Waral.
	T. R. Jones, Birdwood, Marsden Road, Forbes.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
Hard Federation	Manager, Experiment Farm, Cowra.
	Manager, Wagga Experiment Farm, Bowen.
	Manager, Experiment Farm, Temora.
	J. W. Eade, Eade Vale, Euchareena.
	E. J. Allen, Gregra
	Mrs. J. D. Berney, Kildara, Cumnock.
	W. W. Watson, Woodbine, Tichborne.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
	P. Corcoran, Weerona, Moombooldool.
Improved Steinwedel	W. W. Watson, Woodbine, Tichborne.
	E. J. Allen, Gregra.

Wheat—continued.

Marshall's No. 3	Manager, Experiment Farm, Bathurst.
	Manager, Wagga Experiment Farm, Bomen.
	E. J. Allen, Gregra.
Major	Manager, Wagga Experiment Farm, Bomen.
Penny	W. W. Watson, Woodbine, Tichborne
Riverina...	Manager, Wagga Experiment Farm, Bomen.
Wandilla	Manager, Wagga Experiment Farm, Bomen.
Waratah...	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	J. Haggart, Warre Warral.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
Yandilla King	Manager, Experiment Farm, Cowra.
	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	T. J A. Fitzpatrick, Erin Vale, Warre Warral.
	P. Corcoran, Weerona, Moombooldool.
Zealand	Manager, Wagga Experiment Farm, Bomen.

Oats:—

Algerian	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Temora.
	E. J. Allen, Gregra.
Guyra	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Temora
Lachlan	E. J. Allen, Gregra.
Sunrise	J. W. Eade, Eade Vale, Euchareena.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

"THE FARM COOK AND RULE BOOK"

PRACTICALLY all the recipe and home-making books on the market during the last decade have been written for city women."

This fact—surprising, but no doubt largely true—is the *raison d'etre* for a book of nearly 300 pages, comprising probably a thousand recipes or more, which lies before us.

The author, Nell B. Nichols, reminds us that in a day when a large proportion of the population lived on farms, every mother taught her daughters how to cure meat, to manufacture soap, to utilise surplus fruit, and to put away foods for use in the winter. The incidence of life has changed completely for the vast bulk of civilised mankind, and many of the arts and parts of the past have been lost. This book makes an effort—and a useful one—to collect many recipes and modes of the kind referred to, and to make them available in a handy form—withal in accordance with modern requirements. In addition to the conventional hints as to the making of cakes, tasty dishes, beverages, salads, and the like, a section is devoted to the cleaning and polishing of the home, to laundering, to labour saving devices, to beauty secrets (!), and so forth.

Published by the Macmillan Company, New York, from whom our copy comes.

Poultry Notes.

FEBRUARY.

JAMES HADLINGTON, Poultry Expert.

THE successful export of eggs was made a special feature in last month's notes. It was there emphasised that quality and superior packing were the factors that had led to such satisfactory results with the eggs exported recently, and in all probability had ensured a permanent market at a paying price for our eggs overseas It was pointed out, too, that we must continue to send only such eggs as will maintain the reputation already gained

Home Market.

It has been averred, and not without some justification, that the eggs left for home consumption are inferior to those exported. This is only partially true, and for a short period only. The fact is that the export season only embraces about three months of the year, while the whole of the eggs laid during the other nine months are sold for local consumption. Therefore, the whole of our eggs are not picked over for export.

My purpose in this article, however, is to draw attention to the necessity for improving the quality of eggs marketed, whether for local use or for export, because, notwithstanding all that has been said with regard to the quality exported, we can still do better in this regard.

Improved Methods Necessary.

The quality of an egg as it reaches the consumer very largely depends upon the farmer's methods of handling it. Right here many fail, mostly from want of knowledge, I believe, as to the methods that will best preserve the quality of freshness up to the moment of marketing. As is well known, an egg may be inferior or even bad from causes other than being stale. For instance, it may be subjected to heat sufficient to start embryonic development, or to taints from other goods or even from its surroundings. In fact, an egg may be bad although under one week old. On the other hand, an egg kept under good conditions is not necessarily bad, although some weeks old. An egg, even if fertile, is not liable to putrefaction unless subjected to continuous high temperature sufficient to start incubation.

In this connection many farmers gather their eggs twice daily with a view to preserving them from heat, or from being "set" upon by broody hens, and also from breakage and from soiling. This is all very commendable, but many who take all these precautions lower the quality by subsequent mishandling before the eggs are marketed.

Stale eggs are at the bottom of most of the agitation for the stamping of eggs with the date of laying. The difficulty in this connection is that no act of Parliament can make everyone honest. An act might enforce stamping,

but it could not follow every egg from the nest. The dishonest person could evade such an act by keeping his eggs unstamped until they were being sent to market.

The only reliable indication of the freshness of an egg is the size of the air cell situated at the large end. This can readily be seen if a strong light is put behind the egg and the surroundings darkened.

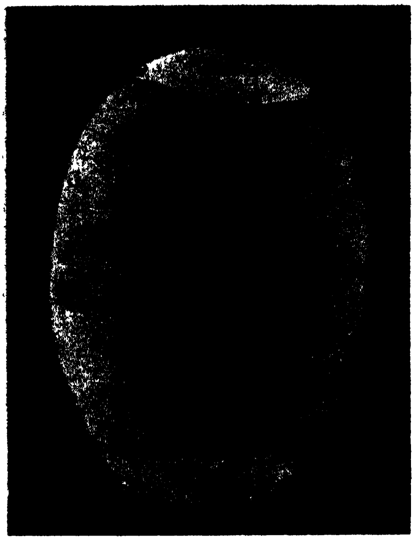


Fig. 1.—Kept for one week.

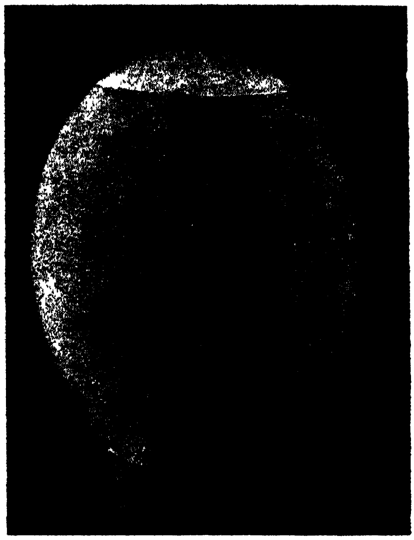


Fig. 2.—Kept for two weeks.

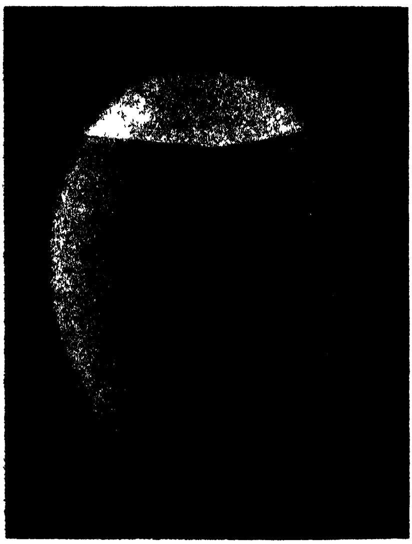


Fig. 3.—Kept for three weeks.

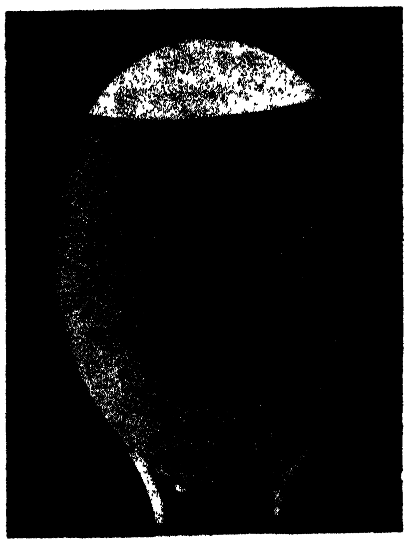


Fig 4.—Kept for four weeks.

Eggs kept in a wooden shed with iron roof, but exposed and without packing.

In order to illustrate this enlargement of the air space under varying conditions, I have had eggs kept over periods extending up to thirty-one days. The accompanying photographs are the result.

Figs. 1 to 4 show the size of the air cell of eggs put aside at intervals during the months of October and November, and kept under conditions conducive to maximum shrinkage, that is, in an enclosed shed built of wood with an iron

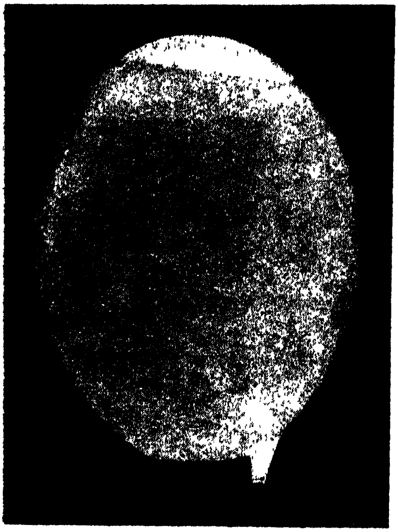


Fig. 5.—Kept for one week.

Fig. 6.—Kept for two weeks.

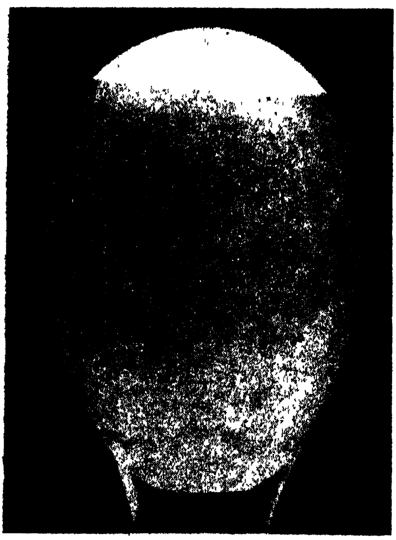


Fig. 7.—Kept for three weeks.

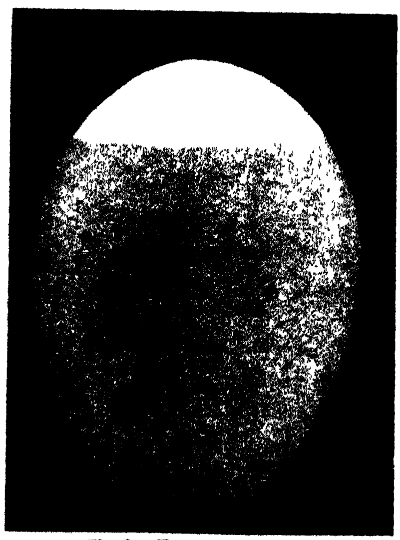


Fig. 8.—Kept for four weeks.

Eggs kept in the same shed as those illustrated on page 147, but packed ready for market as gathered.

roof, and in bins about 4 feet from the roof, the eggs being quite unprotected by packing. The photographs were all taken at one time, on 27th November.

Figs 5 to 8 show eggs, also put aside as they were laid in the same shed, but kept in ordinary egg-cases, packed as for market, and near the floor.

Note the difference in shrinkage of the two sets of eggs, more particularly those of the first and second weeks

Fig. 9 shows the air space in a newly laid egg.

Fig. 10 is an egg that was put in cold store in the usual way, and was kept so from 16th October, 1923, to 8th January, 1924—eighty-four days. Fig. 11 is an egg that was stale when put into cold store, and that was in store only forty-seven days.

The Lessons to be Learnt.

To ensure fresh eggs to consumers. as far as the poultry-farmer can control the factors, eggs should be protected from heat and draughts, and they should be marketed at least twice per week.

Unfortunately, there appears to have been some laxity on the part of poultry-farmers in respect to marketing, and many are known to be in the habit of marketing only once per week. That this practice will grow if unchecked goes without saying, but it is confidently anticipated that the illustrations presented here, together with the explanations given, will be the means of bringing home to poultry-farmers the very vital interests at stake in these matters.

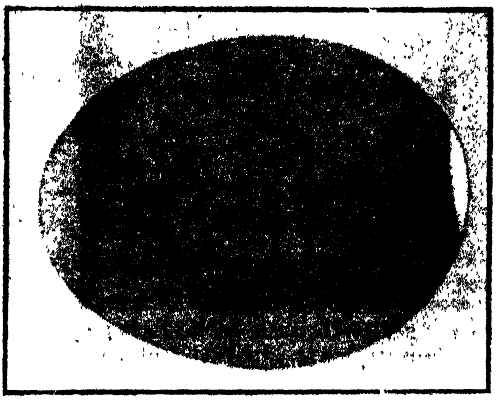


Fig. 9.—A new laid egg.

I can personally vouch for the fact that poultry-farmers as a body are only too anxious to give the public a good article, realising, as most of them do, that quality means a greater local consumption and better prices for those exported or cold-stored.

With regard to the chilled eggs, Figs. 10 and 11 should furnish convincing evidence that if eggs are fresh when put in, and are not kept there over an inordinate period they will be good when they come out. As a matter of fact, judged by the air-cell development, fresh eggs put into cold storage—bar accidents or taints from unallowable sources—will be superior in quality when taken out to eggs kept for three weeks in the open This also can be verified by the test of tasting.

The writer and others have eaten eggs that have been in cold store for months against both stale and fresh eggs, and it is a fact that as between fresh eggs and eggs cold-stored for eighty-four days (and fresh on entering the store) no difference could be detected.

Bad Eggs.

The really bad eggs, apart from staleness, that sometimes reach the consumer, are not necessarily chilled eggs. As a matter of fact for the most part they are not The really bad eggs are those, as already indicated, that have been exposed to conditions that have set up incubation. Such eggs are mostly those that reach the market from distant places. A good many are from river districts, where systematised poultry-farming is not

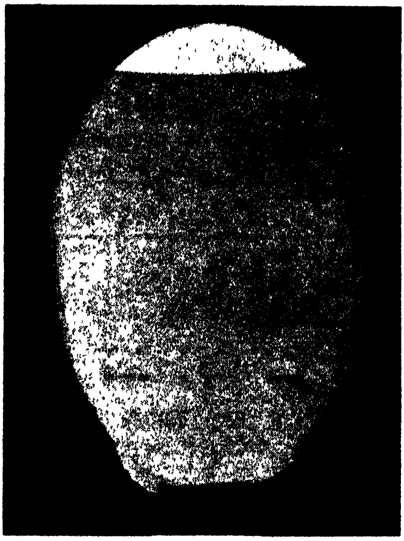


Fig. 10.—Egg stored in chilling chamber for 84 days. *One week old* when placed in chilling chamber.

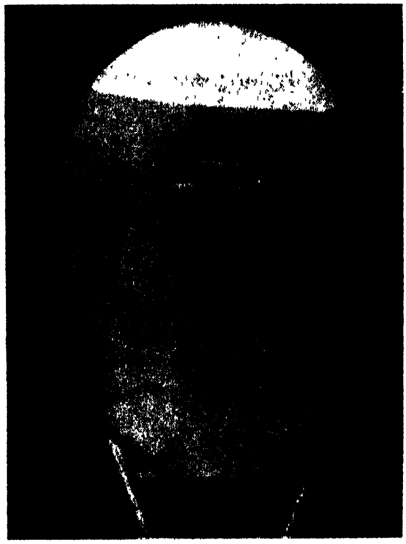


Fig 11.—Egg stored in chilling chamber for 47 days. *Stale* when placed in chilling chamber.

carried on largely. These are the class of eggs for which cold storage is often blamed. Eggs coming from the farms where poultry are kept as a side-line and marketed per medium of the local grocers, are in many cases exposed to all sorts of conditions and kept for varying periods. Hence it is that such eggs are sold as case eggs, and at a reduced price of usually about 25 to 30 per cent. less than new laids. Such eggs have to be "candled," *i.e.*, tested by light, to eliminate bad ones. The bulk are usually stale.

After the explanation conveyed above, it will be readily understood what may be expected in staleness, even if the eggs have escaped damage from the primary cause (putrefaction). At the present time but few eggs marketed in this way find their way into cold storage, except for special purposes.

The great bulk of eggs now either stored or sold direct to the public of this State are the produce of specialised poultry farms. The quality is, therefore, within the control of the genuine poultry-farmer. It is to him that the public will look for the best. Poultry-farmers' co-operative societies should be quite capable of dealing with this matter. Organisation on sound lines could solve all these problems.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Yanco Irrigation Area A. Society	W. Roseworn	Feb. 12, 13
Nowra (Jubilee) P. and A. Association	...	,, 14, 15, 16
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	,, 15, 16
Guyra P. A. and H. Association	P. N. Stevenson	,, 19, 20, 21
Alstonville A. Society	W. J. Dunnet	,, 20, 21
Pambula A. H. & P. Society	L. K. Longhurst	,, 20, 21
Tilba A.P. and H. Society	R. L. Hapgood	,, 20, 21
Nepean District A. H. and I. Society	C. H. Fulton	,, 20, 21, 22
Wyong District A. Association	L. C. Reeves	,, 22, 23
Southern New England P. and A. Association (Uralla)	C. T. Griffin	,, 26, 27, 28
Newcastle A. H. and I. Association	E. J. Dann	,, 26 to Mar. 1
Candelo A. H. and D. F. Association	R. E. Johnson	,, 27, 28
Moruya A. and P. Society	H. P. Jeffery	,, 27, 28
Gunning P. A. & I. Society	G. E. Ardill	,, 27, 28
Robertson A. and H. Society	M. M. Westropp	,, 27, 28
Manning River A. and H Association (Taree)	R. Plummer	Mar. 4, 5, 6
Inverell P. and A. Association	...	,, 4, 5, 6
Tenterfield P. and A. Association	...	,, 4, 5, 6
Tumut A. and P. Association	T. E. Wilkinson	,, 5, 6
Braidwood P. A. & H. Association	R. L. Irwin	,, 5, 6
Yass P. and A. Association	E. A. Hickey	,, 5, 6
Bellinger River A. Association (Bellingen)	J. F. Reynolds	,, 5, 6, 7
Oberon A. H. and P. Association	C. S. Chudleigh	,, 6, 7
Berrima A. H. and I. Society	W. Holt	,, 6, 7, 8
Moss Vale P. and A. Association	...	,, 6, 7, 8
Central New England P. & A. Assoc. (Glen Innes)	Geo. A. Priest	,, 11, 12, 13
Mudgee A. P. H. and I. Association	J. H. Shaw	,, 11, 12, 13
Dorrigo and Guy Fawkes A. Association	A. C. Newman	,, 12, 13
Warialda P. and A. Association	Lanagan Bros.	,, 12, 13
Hunter River A. and H. Society (West Maitland)	J. S. Hoskins	,, 12 to 15
Hastings P. A. and H. Society (Wauchope)	T. Suters	,, 13, 14
Batlow A. Society	C. S. Gregory	,, 18, 19
Coonabarabran A. and P. Association	C. D Cox	,, 18, 19
Armidale P. and A. Association	...	,, 18, 19, 20
Cumnock P. A. and H. Association	K. J. Abernethy	,, 19
Bowraville A. Association	C. H. Sullivan	,, 19, 20
Crookwell A. P. and H. Society	C. H. Levy	,, 20, 21
Lidcombe Agricultural Bureau	J. M. Macey	,, 22
Rydal A. H and P. Society	S. Bruce Prior	,, 22
Blayney A. and P. Association	H. R. Woolley	,, 25, 26
Richmond River A. H. and P. Society (Casino)	P. M. Swanson	,, 25, 26, 27
Tamworth P. and A. Association	F. G. Callaghan	,, 25, 26, 27
Cooma P. and A. Association	C. J. Walmsley	,, 26, 27
Narrabri P. A. and H. Association	E. J. Kimmorley	,, 26, 27
Dungog A. and H. Association	W. H. Green	,, 26, 27, 28
Goulburn A. P. and H. Society	F. D. Hay	,, 27, 28, 29

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1924.

Society.	Secretary.	Date.
Campbelltown A. Society	J. T. Deane	Mar. 28, 29
Cessnock A. Association	Bill Brown	„ 28, 29
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	April 2, 3, 4
Blacktown A. Society	J. McMurtrie	„ 4, 5
Camden A. H. & I. Society	G. V. Sidman	„ 4, 5
Orange A. and P. Association	Geo. L. Williams	„ 8, 9, 10
Upper Hunter P and A. Association (Muswellbrook)	R. C. Sawkins	„ 9, 10, 11
Gloucester A. H. and P. Association	F. S. Chester	„ 10, 11
Royal Agricultural Society of N.S.W.	H. M. Somer	„ 14 to 23
Bathurst P. and A. Association	...	„ 30 to May 2
Hawkesbury District A. Association	H. S. Johnston	May 1, 2, 3
Dubbo P. and A. Association	...	„ 7, 8
Upper Manning A and H. Association (Wingham)	D. Stewart	„ 7, 8
Clarence P. and A Society	L. C. Lawson	„ 7, 8, 9, 10
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	Aug. 26, 27, 28
Grenfell P. A. & H. Association	Geo. Cousins	Sept. 2, 3
Cootamundra A. P. H. & I Association	W. W. Brunton	„ 9, 10
Ganmain A. & P. Association	A. R Lhuede	„ 16, 17
Temora P. A. H. & I. Association	A. D. Ness	„ 16, 17, 18
Junee P. A. and I. Society	T. C. Humphrys	„ 23, 24
Corowa P. A. and H. Society	J. D. Fraser	Oct. 3, 4
Berrigan A. and H. Society	R. Wardrop	„ 7
Narandera P. & A. Association	W. H. Canton	„ 7, 8.
Deniliquin P. and A. Society	P. Fagan	„ 15

A Pest of Sweet Potatoes.

"I have a boring pest which eats into my sweet potatoes. I am sending to you in a bottle some small beetles which I think are the adults of the grub that causes the trouble; they were always found sheltering under the potatoes that were left on the ground after digging. What is the best method of control ?"

The writer of the foregoing was informed that the specimens forwarded were those of the sweet potato weevil (*Cylas formicarius*), the larvæ of which tunnel almost exclusively in the sweet potato tubers and a few other closely-allied plants. Although winged, its power of flight is limited, and the spread of the pest is largely caused by transportation of infested tubers or plants, which should therefore be obtained from localities known to be free from weevil.

Clean cultivation will help considerably in reducing the damage. Infested fields should be cleaned up promptly, and all stems, tubers, and other remnants burnt and the land kept free from "volunteer" potatoes. The potatoes should be harvested promptly and all infested tubers separated from the others, those that are too badly damaged being cooked for stock or burnt Rotation of crops is also desirable; the same land should not be used year after year where weevils are present, and the new crop should always be planted well away from the neighbourhood of the seed-bed.—T. McCarthy, Assistant Entomologist.

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Farmers' Experiment Plots.

WHEAT, OAT AND BARLEY EXPERIMENTS, 1923.

Central-western District.

W. D. KERLE, Senior Agricultural Instructor.

THE farmers who co-operated with the Department of Agriculture in field experiments with wheat in the season just past were :—

V. D. Cox, "Burrundulla," Mudgee.
H. B. Loveband, "Blenheim," Coonabarabran.
L. C. J. Broughton, "Berrima," Mendooran.
Robinson Bros., Tallawang, Gulgong.
Wm. Burns, "Goongirwarrie," Carcoar.
V. Granowski, Mooren, Binnaway.
D. McMaster, Oban, Coolah.
C. W. Newman, Ashby, Baradine.
D. Lewis, "Hilltop," Craboon.
T. H. Williams, Bolaro, Dunedoo.

Yields were not obtained from Dunedoo or Baradine, where drought conditions similar to the north-west prevailed.

The season was very little better than the disastrous one of 1922, which it resembled considerably. The low precipitation that season, which was relieved somewhat by substantial falls in December, continued throughout the summer and autumn of 1923. In the middle of May some portions of the district received sufficient rain to germinate the wheat, but in the majority of cases germination occurred with the breaking of the drought in early June. The majority of farmers sowed the bulk of their crops in a dry seed-bed, and had very dirty crops in consequence. Fallowed land did not give the increased yields so much in evidence last season, owing chiefly to the very light rainfalls that could be conserved. The only decent fall—in December, 1922—came at a time when harvest operations prevented immediate working of the soil to conserve the moisture, and hence in most cases it was lost. Light falls in January, March, and May were the only precipitations for five and a half months, and the light nature of these falls can be gauged from the fact that at sowing time the soil was quite devoid of moisture and the May fall was insufficient to germinate the seed.

The germination generally was not very satisfactory owing (1) to too deep sowing, which was frequently unavoidable on account of the looseness of the dry soil and consequent tendency of the drill to bury; (2) to a certain amount of malting as a result of the May precipitation; and (3) to damage due to pickling with bluestone without using limewater to neutralise the corrosive action of the bluestone. The heavy rainfall in June, ranging from 4 to 6 inches, was followed by six weeks of cold, dull weather, in which the wheat made very poor growth. The advent of warm weather in early

spring caused a rapid growth, but the prospects of excellent crops were soon blighted by strong, drying winds which reached cyclonic force toward the end of September. In the southern portion of the district rains in October relieved the situation, but their absence in the northern end of the district, at Baradine, &c., as in the north-west, was responsible for crop failures. In November a fall aggregating about 1½ inches helped considerably to increase the grain yield.

The crops suffered considerably in some localities from attacks of caterpillars, particularly in the Baradine district. Fungus diseases were also very prevalent—flag smut, take-all, foot-rot, and ball smut in particular.

The rainfall recorded at each centre was:—

—	Mudgee.	Coonabarabran.	Mendooran	Tallawang.	Carcoar.	Mooren.	Coolah	Dunedoo.
(1) FROM PLOUGHING TO GERMINATION OF SEED.								
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Aug., 1922–May, 1923	8·90	...	...	...	...	...	...	...
Sept., 1922–May, 1923	...	...	...	6·79	8·77	8·17	...	...
Nov., 1922–May, 1923	...	...	1·41	...	...	...	5·98	5·08
Feb.–May, 1923	...	1·71	...	...	...	...	...	...
(2) FROM GERMINATION TO MATURITY.								
1923.								
June	4·45	4·43	4·09	2·50	6·03	3·79	4·20	4·08
July	2·98	2·10	1·52	2·68	6·09	1·55	1·64	1·72
August	1·05	·45	·24	·48	2·27	·56	·72	·47
September	2·28	1·63	1·55	2·81	5·82	1·81	2·21	2·76
October	2·69	·62	...	3·10	3·16	1·57	1·73	1·44
November	1·75	1·04	·89	1·37	1·34	·88	1·48	1·21
December	to 17th nil.	to 5th nil.	...	...	to 16th ·10	...	to 13th nil.	to 7th nil.
Total	15·20	10·27	8·29	12·94	24·81	10·16	11·98	11·68

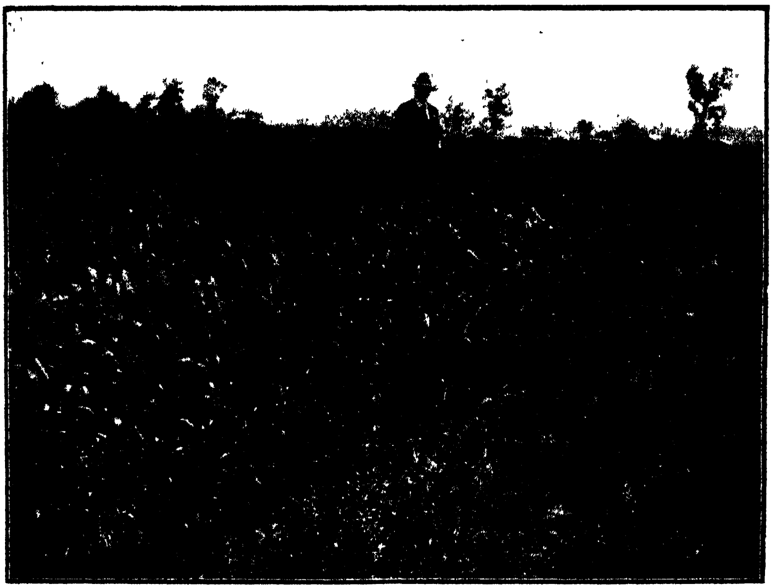
Details of Localities.

Mudgee.—The Mudgee experiments consisted of a trial of varieties for (1) hay and (2) grain. The varieties selected for the former were late-maturing ones—Cleveland, Yandilla King, Warden, &c.—but as they did not germinate until June, and were still further delayed by dull, cold weather, they did not attain any height and were rejected for purposes of comparison.

Seven varieties were harvested for grain on 17th December. These were sown on 17th May on fallowed ground, ploughed August, 1922; spring-toothed end of September; one-way disced March, 1923, and springtoothed for sowing; rate of seeding, 60 lb., and superphosphate, 65 lb. During

the early stages of growth the plot of Wilfred stood out above the others, but it was eventually outyielded by Queen Fan and Onas, which both gave the very creditable yields, under the circumstances, of just under 20 bushels per acre. The plots suffered in yield from weed growth, which, owing to the seeds germinating simultaneously with the wheat, was fairly excessive.

Coonabarabran.—The winter fodders, which form a definite rotation with wheat in the experiment area, were practically a failure in 1922. owing to the drought. The ground for wheat was not ploughed until February; harrowed twice in March; springtoothed on 11th May, and sown on 25th May. Seed was applied at 60 lb. per acre, and superphosphate at 56 lb.



Plot of Queen Fan Wheat at Mr. V. D. Cox's, Burrundulla, Mudgee.
The yield was 19 bushels 30 lb. per acre.

The germination was very satisfactory. The season was worse here than further south, the October precipitation being much lighter. The majority of the crops in the district failed completely. Warden, with a yield of 16 bushels, was an excellent plot for the season, while Union, although 3½ bushels lighter, was superior to a number of older varieties. Glencope, which has done well at this centre in the past three seasons, was originally grown in the variety trials.

Carcoar.—The trial here was one of varieties for hay on a grey slatey loam. The land was ploughed with the mouldboard plough on 28th September, springtoothed on 22nd October, reploughed 2nd February, 1923, and springtoothed on 23rd May. It was sown on 24th May, the ground

being in excellent condition for sowing as regards tilth and moisture; harrowed after sowing. The seed was applied at the rate of 1¼ bushels per acre, and superphosphate at 56 lb. The season here was too wet. June and July had over 12 inches, and September just under 6 inches, the falls in the growing period totalling 24·81 inches. The surface of the ground set hard and stooling was not strong. The growth made under the adverse seasonal conditions was surprising, all varieties attaining a height of 4 feet to 4 feet 6 inches, and yielding surprisingly well.

A trial of different amounts of seed and superphosphate per acre with Cleveland was sown under similar conditions and yielded as follows:—

		t.	c.	q.	lb.
Cleveland, 1½ bus. seed, 80 lb. superphosphate	...	2	11	0	0
,, 1¼ ,, 56 lb. ,,	...	2	9	1	14
,, 1¼ ,, 80 lb. ,,	...	2	1	3	12
,, 1½ ,, 56 lb. ,,	...	2	0	1	22

Plot of Waratah Wheat at Burrundulla, Mudgee.
The crop made 16 bushels per acre.

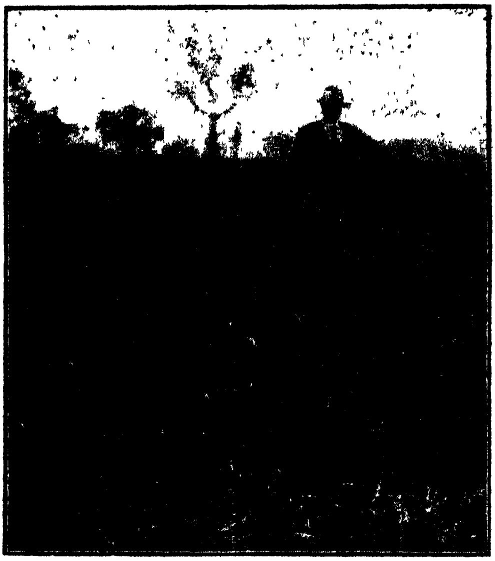
Coolah.—This was the first season's trial at this centre. A two-course rotation of (1) winter fodders and (2) wheat is being adopted here. The sowing of the wheat variety trial was made on 19th and 20th June, at the rate of 1 bushel of seed per acre, and 45 lb. superphosphate.

The ground was ploughed in November, but not worked until the latter end of May, when it was springtoothed for sowing. Sheep were running on the area most of the time, but dry weather did not permit weed seeds to germinate and the varieties suffered from excessive weed growth. Two plots of Federation were sown—one treated with copper sulphate, 1½ per cent. and the other with copper carbonate, 2 oz. per bushel. Both plots germinated

very well, and although the latter appeared in the early stages of the growth to be thicker and stooling better, the ultimate yields were practically the same, viz.:—

	bus.	lb.	
Copper carbonate	12	46	per acre
Copper sulphate	12	33	,,

Craboon.—The variety trial here was sown on 10th May on ground fallowed from November and worked with springtooth in March and just prior to sowing. The seed was applied at 60 lb. per acre, and superphosphate at 56 lb. The season was particularly patchy at this centre, the winds in October and September being particularly severe.



Plot of Onas Wheat at Burrundulla, Mudgee.

The yield was 19 bushels 25 lb. per acre.

The yields obtained from the new variety, Aussie—a Federation × Gluyas cross—was the outstanding feature of this trial. Riverina, a full sister to Canberra, was very little inferior to that variety and Hard Federation. Gresley, which yielded badly, was handicapped by a very poor germination.

Tallawang.—The two paddocks of approximately 30 acres reserved for these experiments are worked on a two-course rotation of (1) winter fodders and (2) wheat.

The winter fodders of Skinless and Cape barley and peas made good growth considering the droughty season of 1922, and provided excellent sheep feed. The sheep were removed just prior to ploughing on 25th September. Heavy

December rain caused the ground to set, and a shallow ploughing was made in February. No further cultivation was done before sowing on 11th June, the harrows following the drill. From first ploughing to sowing only 6·79 inches of rain were recorded. The germination of the plots was satisfactory with the exception of Canberra, the comparatively poor stand being responsible for a big reduction in yield. The plots were very free from weed growth, and considering the season made satisfactory growth and gave very creditable yields. The Federation × Nullah crossbred, known as Union, gave the excellent yield of 25 bushels 16 lb., equalling Hard Federation. Queen Fan, also tried here for the first time, yielded very well. Waratah, which the previous season gave the highest yield with 20 bushels 40 lb., on a rainfall of 6·73 inches, yielded 21 bushels 41 lb. this season, with four others higher in yield.

Mendooran.—The cereal trials at this centre consisted of a variety trial with wheat, a manurial trial with Hard Federation, and a barley variety trial. The ground was disc-ploughed 5 inches deep in November and received no other working with the exception of a harrowing in April. As only 80 points of rain fell between November and the end of May, cultivation of the soil was unnecessary. The soil is of a grey sandy nature with a sandy subsoil, and responds to fertilisers. The germination of the plots was not very satisfactory. Considerable malting took place owing to a heavy shower of rain in May, and as a result the stands of Waratah and Canberra were poor, while Union practically failed. The season was very patchy, and no growth was made until August. The yields obtained were surprisingly good in view of the meagre rainfall during both fallow and growing periods.

Hard Federation, which with 56 lb. superphosphate gave the highest yield, gave a 3 bushels increase per acre over an unmanured plot. Florence and Firbank also yielded well, and are safe varieties for late sowing in this locality, having given excellent results in these trials for a number of years.

The barley varieties yielded as follows:—

	bus.	lb.	
Cape	19	12	per acre.
Trabut	19	0	,,
Skinless	16	0	,,

Mooren.– The variety and manurial trials were sown on 22nd to 24th May on fallowed ground, with 50 lb. seed and 45 lb. superphosphate per acre. The soil, a light reddish sandy loam, was dry and rough at sowing time. It was ploughed 24th and 25th September with the disc plough, disc-cultivated 15th to 17th February, harrowed 16th to 18th May. Eleven varieties of wheat were under trial, including Rymer, which was grown the previous season on the black soil on which it appears to stand up and yield better than the newer varieties.

The season at this centre was particularly bad, very hot and dry winds being experienced from 20th September almost continuously to 15th October. The September, October, and November rains were lighter than at other centres, and the yields are light in consequence.

Considerable increase in yield resulted from the use of superphosphate. In a trial with Hard Federation the increase amounted to 4 bushels 53 lb. with 100 lb. per acre, and to 4 bushels 3 lb. with 65 lb.

Canberra, Hard Federation, and Waratah were the leading varieties in point of yield.

WHEAT Variety Trials.

Varieties.	Mudgee.	Coonabarabran.	Mendooran.	Tallawang.	Binnaway.	Coolah.	Craboon.	Carcoar.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	t. c. q. lb.
Hard Federation	16 31	14 25	25 5	25 10	9 39	12 10	12 32	......
Queen Fan ...	19 30	..	..	23 27	...	...	...	......
Onas	19 25	...	...	...	8 48	...	...	......
Wilfred ...	17 42	...	...	..	8 0	...	...	......
Union	...	12 30	...	25 16	...	...	...	......
Waratah ...	16 0	11 0	12 7	21 41	9 24	13 20	...	......
Florence ...	12 20	...	24 10	...	...	...	..	......
Warden ...	24 25	16 0	...	...	6 52	...	10 12	2 10 2 0
Wandilla ...	...	10 43	...	22 11	7 41	...	8 16	1 4 0 0
Aussie	...	...	...	17 52	...	...	15 26	......
Canberra ...	...	14 44	18 15	21 23	11 26	11 50	12 53	......
Cleveland ...	...	10 17	...	...	...	...	...	2 9 1 14
Major	...	10 7	...	...	8 28	12 45	...	......
Firbank ...	...	...	22 45	...	...	...	...	......
Currawa ...	...	...	21 0	...	...	...	...	......
Riverina ...	...	...	...	...	...	...	11 12	......
Yandilla King...	...	...	...	...	5 46	...	7 32	2 12 2 20
Marshall's No. 3	...	...	...	...	...	...	7 50	......
Gresley... ...	...	...	...	...	6 56	11 26	7 26	2 18 3 0
Federation ...	...	...	...	...	...	12 32	..	......
Rymer ...	...	...	...	...	5 55	...	...	......
Glencope ...	...	10 47	...	...	...	...	...	......
Bathurst No. 17	...	10 24	...	...	...	...	...	1 7 2 0
Bathurst No. 9..	...	...	...	...	...	...	...	......

MANURIAL Trials with Hard Federation Wheat.

Manurial Treatment.	Mendooran.	Mooren.	Coolah.
	bus. lb.	bus. lb.	bus. lb.
Superphosphate, 100 lb. per acre	...	10 29	...
,, 65 lb. ,, ...	...	9 39	...
,, 56 lb. ,, ...	25 5	...	...
,, 45 lb. ,, ...	...	...	12 10
No manure	21 50	5 36	10 4
Increase due to fertiliser ...	3 15	4 53	2 6

North-western District.

MARK H. REYNOLDS, Senior Agricultural Instructor.

THE following farmers carried out experiments in co-operation with the Department in 1923:—

R. J. Brittingham, Wee Waa.
T. Higgins, Inverell.
V. Rolfe, Inverell.
R. A. Studd, Boggabri.
A. M. Paterson, Delungra.
M. McDonald, Gunnedah.
R. Kingston, Warrah Creek.
J. Drake, Narrabri.
A. Haskins, Duri.
W. Lye, Loomberah, Tamworth.
L. Latham and W. King, Baan Baa.

The rainfall in the north-west during the past year was below the average, and mostly fell in small quantities, excepting in June and July. From Little Plain to Oakwood in the Inverell district and to the east of Tamworth (notably about Loomberah) opportune rains in October and November produced yields of 30 bushels per acre from land that had not been fallowed and where without the rain the crops would have failed.

Although fallowing from the spring of 1922 had been practised by some, there was little moisture in the subsoil owing to the light rainfall Bunt was very prevalent, especially where the seed had received no preventive treatment. Dusting of the seed wheat with dry copper carbonate proved efficacious, and this method of bunt prevention is gaining favour. Apart from a small percentage of loose or flying smut, chiefly in Canberra, the wheat crop was generally free from disease.

The seed wheat and oats supplied for the plots was immersed in a 1½ per cent. bluestone solution for three to five minutes and dried to destroy bunt spores and prevent reinfection, and the cleanness of the crop showed the efficacy of the treatment, but the damage caused on occasion to the germ of the grain was evidenced this season, for although sowing was at the rate of 45 to 56 lb. per acre the stand was generally thin. It was also again demonstrated that bluestoning delays germination. This delay and the thin strike enabled such weeds as variegated thistle, stagger weed, and trefoil to obtain a firm hold before the wheat was strongly enough up to contend with them. Where wheat germinates quickly and sufficiently covers the ground, weeds are often deterred from germinating even on the rich soils about Delungra and Inverell. To the hold weeds obtained and the consequent depletion of moisture are due the low yields on the plots at these places. From the plots throughout good quality grain was harvested. A fertiliser trial with superphosphate at rates ranging from 30 to 133 lb. per acre gave beneficial results at Duri and at Inverell on the wheat plots only.

RAINFALL Record.

Month.	Duri.	Tamworth.	Boggabri.	Gunnedah.	Warrah Creek.	Delungra.	Inverell Oat Plot	Inverell Wheat Plot
1923.								
May	16	...	11	...	...	...	...	48
June	380	370	218	151	...	334	313	404
July	155	160	102	92	150	167	181	192
August	56	56	43	44	166	28	32	21
September	199	205	169	170	60	179	310	326
October	26	82	162	10	250	309	211	260
November	...	192	44	...	70	...	58	52

The rainfall from November, 1922 to May,1923, inclusive, was as follows :—Tamworth, 840 points; Duri, 569; Delungra, 1,044.

Details of the Plots.

Duri.—Red to chocolate soil, of shale formation; land cropped for five years (1919 fallow, 1920 and 1921 wheat, 1922 fallow). Ploughed 5 inches in October, 1922, followed by four cultivations (the first two months after ploughing) with springtooth cultivator prior to seeding. These cultivations were mainly given to keep weeds in check, although sheep were also utilised for this purpose. Seeding was carried out in dry soil on 18th and 19th May at the rate of 44 to 50 lb. per acre.

A soil variation caused reduced yields on portion of the Currawa and Riverina plots. This experiment offered a striking evidence of the increased growth and yield of grain on well fallowed land.

In the fertiliser trials the unmanured area yielded 22½ bushels per acre, superphosphate at 30 lb. per acre 27 bushels, and superphosphate at 75 to 80 lb. per acre 28¾ bushels.

Delungra.—Black loam of basaltic origin. Cropped with wheat in 1921 and practically fallowed from February, 1922. Ploughed 4 to 10 inches deep in February, 1922, and sown with maize and Sudan grass. Owing to dry conditions, these crops failed and the residues were fed off by sheep. This was followed by two springtooth cultivations to keep the wild oats in check and feeding off from time to time until October, 1922, when a second ploughing was given. Between this and seeding two further springtooth cultivations were given. The seed was sown at the rate of 56 lb. per acre in a dry seed-bed on 30th and 31st May.

The slow and poor germination previously mentioned enabled variegated thistles especially to get a firm hold. On an adjoining section of land similarly cultivated but where the seed had been treated by the dry copper carbonate method a good germination and stand resulted, with few weeds, averaging 15 bushels per acre. As a method of controlling variegated thistles,

Mr. Paterson indicated a section on which two seasons previously the thistles had been mowed before the seed matured, resulting in but few thistles being present in that part this season.

The wheats matured in the following order:—November 8th, Riverina; 9th, Canberra and Clarendon; 18th, Florence; 23rd, Gresley; 25th, Wandilla, Improved Steinwedel and Currawa; 26th, Waratah; 9th December, Queen Fan.

In many localities, owing to the hot conditions obtaining about ripening time, there is little difference in the maturing dates of the different varieties; but at Deluugra, on account of cooler and better moisture conditions, the contrary often obtains, as in the case indicated above.

Loomberah.—Red loam, of shale and limestone formation. Broom millet was harvested off the land in 1921. Ploughed June, 1922, 6 inches deep, harrowed end of September, cultivated 3 inches deep in October with springtooth cultivator to destroy Bathurst burrs, which were covering the ground thickly. Seed sown 9th June at the rate of 50 lb. per acre. Excepting in the case of Gresley a good germination and strike resulted. Union showed greatest damage from the dry conditions of early spring; Wandilla was affected to a less extent. A top-dressing with superphosphate at the rate of 56 lb. per acre was made on portions of the Clarendon and Wandilla section in October, but no difference was obtained over the unfertilised section. This was a most promising experiment throughout, even although spring conditions (as elsewhere in the north-west) were very dry until early October. The wheats were then looking well, having attained heights varying from 2 feet (in the case of Wandilla) to 3 feet (in the case of Early Bird). To the beneficial effect of fallow this holding out until the good rains toward the end of October must be attributed.

Willow Tree.—Red basaltic loam; land cropped 1922 with wheat, not fertilised. Cultivated in preparation for the trial twice immediately preceding the drilling in of the seed. Sown 21st July, in a moist seed-bed at the rate of about 1 bushel per acre. Good germination and satisfactory stand resulted. The good yield is attributable to the opportune rainfalls from 18th October to 5th November (320 points), together with that of July.

Baan Baa.—Red sandy loam; cropped with barley for grain in 1921. Cultural operations commenced with a 5-inch ploughing in August, followed by a disc-cultivation in November, 1922. In 1923 the land was again disc-cultivated in January and cultivated with the springtooth cultivator in May and again in June. The seed was sown in a moist bed on 30th June and 6th July, at the rate of 48 to 53 lb., but was slow in germinating and the somewhat thin stand was further reduced on some plots by parrots destroying sprouted grain.

Boggabri.—Red sandy loam; cropped with wheat for grain in 1920, and subsequently, until given a 4 to 6-inch deep ploughing in September, 1922, grew weeds and native grasses which were fed off from time to time by sheep. A disc-cultivation in January, 1923, to destroy Bathurst burrs and summer

grass, was followed by harrowing in May and a springtooth cultivation just prior to seeding. The seed was sown from 12th to 14th June in a slightly moist (in parts dry) seed-bed, at the rate of 50 lb. per acre, a fair germination and stand resulting.

Inverell (Wheat Plots).—Dark chocolate-coloured basaltic loam. Land broken from pasture for the first time in 1921 and sown with maize; wheat grown in 1922. Cultural operations for the experiment started with burning of the stubble and ploughing 3 to 4 inches deep in February, 1923, at which time the land was in a very dry condition. Prior to seeding the land was harrowed and twice springtooth cultivated. Sown 10th and 11th May, at the rate of 49 lb. seed per acre. A thin stand resulted, enabling weeds to be prevalent, which seriously affected the yield. An application of superphosphate at the rate of from 100 to 108 lb. per acre gave a yield of 12 bushels per acre as compared with 7½ bushels on the unmanured plot.

Inverell (Oat Plots).—Black loam of basaltic origin; not cropped in 1920 or 1921; maize sown in the spring of 1922 but failed to cob and was fed off. Ploughed 3½ inches deep during November, 1922, harrowed on 21st May, and sown broadcast by hand at the rate of 50 lb. seed per acre on 28th and 29th May, the land being subsequently harrowed and springtooth cultivated to cover the seed. Yarran, Guyra, Quandong, White Tartarian and Mulga produced good growth during the winter and early spring. Good quality oats was harvested from all varieties. The low yields are partly due to poor germination followed by dry weather, which caused poor stooling.

Gunnedah.—Red free-working loam of shale formation; wheat grown on the land for previous two seasons. Land ploughed 5 inches deep in February in preparation for the experiment, and no further cultivation given until a fortnight before planting. Seed sown on 8th and 9th June in a moist seed-bed, a fair germination and stand resulting. Good quality grain was harvested. The plots of Currawa and Queen Fan failed from the effects of moisture deficiency.

Wee Waa and Narrabri.—The wheats at Wee Waa were not sufficiently prolific in grain to warrant harvesting separately, and at Narrabri none were harvested. The effect of the dry conditions in the north-west was more pronounced at these two places than elsewhere.

RESULTS of Oat Variety Trials.

Variety.	Duri.	Inverell.	Variety.	Duri.	Inverell.
	bus.	bus.		bus.	bus.
Fulghum	35	12	Yarran	14¾	7½
Quandong	33½	16⅓	Guyra	26	11
Sunrise	30⅔	...	White Tartarian	...	4
Ruakura	27½	16	Mulga	...	18
Algerian	18½	...			

RESULTS of Wheat Variety Trials.

Variety.	Duri.	Loomberah.	Baan Baa.	Boggabri.	Inverell.	Delungra.	Gunnedah.	Warrah Creek.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Currawa	12¾	...	8	poor.	11½	2	poor.	32
Riverina	13	...	5⅓	8	19	8	5¾	23
Hard Federation	17¼	34¼	7	5½	...	...	6½	36
Florence...	17⅓	...	...	...	13	4	...	...
Canberra	19	32½	7	7⅓	17	7	7½	34
Waratah	19¾	...	6⅓	...	15⅓	5¾	4	32¾
Clarendon	17⅓	32½	..	14⅓	14½	7½	...	19
Aussie	22	...	7	7⅛	...	...	...	31
Gresley	24	26½	5	poor.	12⅓	8	4½	...
Wandilla	...	42⅙	7	poor.	...	Failed	...	...
Union	...	25½	8	6⅓	17	5½	2½	35
Early Bird	...	30	5	11	...	...	5¾	...
Queen Fan	...	...	6⅓	...	19	3	Failed	...
Improved Steinwedel	...	...	...	11⅛	...	5¾	3¼	...
Onas	..	...	...	poor.	...	...	...	...
Cleveland	...	...	...	...	14	2	...	...
Warden	...	30	...	...	...	...	...	...

COMPULSORY DESTRUCTION OF DISEASED CATTLE.

As the outcome of a discussion and resolution by members of Horse Ridges branch of the Agricultural Bureau, the question was recently addressed to the Department whether farmers would be compensated when compelled to destroy cattle attacked by disease.

It being assumed that the issue arose from the provisions of the Dairies Supervision Act, the question was referred to the Director-General of Public Health, who stated that that Department did not consider that compensation should be paid to stockowners whose cattle had been condemned for diseases.

The destruction of the cattle by the authorities was not only in the interest of the meat and milk consuming public, but was also most beneficial to the owners themselves, as the exercise of legal powers under the Cattle Slaughtering and Diseased Animals and Meat Act, 1902, caused the destruction of animals whose retention would mean the rapid dissemination of disease and increased loss to stockowners.

LUCERNE IN ELEVATED LOCALITIES.

COULD lucerne be grown uccessfully on dark chocolate basalt soil at an altitude of 3,300 feet, was the query put to the Department by a Walcha correspondent recently. The land had grown maize for ten years in succession without a failure, yielding about 45 bushels to the acre.

It was stated, in reply, that the Department was growing lucerne successfully at Glen Innes Experiment Farm under conditions similar to those mentioned. The climatic conditions at Glen Innes were more severe than at Walcha and the surrounding district.—J. N. WHITTET, Agrostologist.

Broom Millet Growing in New South Wales.

H. WENHOLZ, B.Sc.Agr., Special Agricultural Instructor.

BROOM millet seems to have accommodated itself to a few particular districts although there is a wide range of country in New South Wales in which the soil and climatic conditions are suitable for the crop. The industry has become established chiefly in a few centres like the lower Hunter River, the Tamworth district, the Richmond River, the Manning River, and the Tumut district, and has not apparently made much progress outside these districts.

This is chiefly due to the fact that these districts developed the industry first, and are able to supply the normal requirements of the trade, except in adverse seasons, when manufacturers are able to import readily from Italy. This importation, despite a tariff of £8 per ton, has the effect of curbing the price, preventing it from going to high levels, except during periods of shipping or trade dislocation, such as happened during the recent war, when the price of broom millet went to £100 per ton.

Even during that time, however, very few districts outside those mentioned took up the growing of broom millet. This can be partly accounted for by the fact that some experience is almost necessary to handle the crop successfully. Moreover, a little extra machinery is required to deal with it, and this makes it a little more difficult to establish in any new district.

ACREAGE under Broom Millet in New South Wales 1917–18 to 1921–22.

District	1917–18	1918–19	1919–20	1920–21	1921–22
	acres.	acres.	acres.	acres.	acres.
North Coast (chiefly Richmond River) ...	391	574	749	212	77
Lower North Coast (Manning River) ...	149	250	370	207	179
Central Coast (chiefly Lower Hunter River).	1,024	1,275	896	397	579
County Cumberland and South Coast ...	13	9	7	25	3
Tablelands	2	18	118	56	9
North-western Slopes (chiefly Tamworth District.)	275	735	1,778	331	318
Central-western Slope	...	...	...	5	...
South-western Slope (chiefly Tumut District).	31	34	159	169	59
Central Plains (Coonamble District—irrigated.)	...	...	...	1	2
Riverina (chiefly Murrumbidgee Irrigation Areas).	33	124	143	50	4
Total, New South Wales	1,918	3,019	4,220	1,453	1,230

The following table shows the amount of broom millet produced in the State, the value of the crop in total and per ton, and the amount imported for the years 1912–13 to date.

Year ended 30th June.	Production.	Value. Total.	Value. Average per ton.	Imports.*
	cwt.	£	£	centals.
1912–13	11,154	13,660	30	3,870†
1913–14	12,044	18,070	32	317‡
1914–15	10,400	14,560	30	939
1915–16	15,201	24,650	35	8,138
1916–17	8,795	13,190	32½	25
1917–18	9,261	25,470	60	1
1918–19	13,833	41,370	74½	Nil
1919–20	16,703	37,580	55	2,956
1920–21	8,126	14,560	40	2,394
1921–22	8,638	17,490	45	179
1922–23	......	......	...	3,505

* The figures under this heading include rice straw, of which a small quantity is imported. The separate figures are not available
† Year ending 31st December, 1913.
‡ Six months ending 30th June, 1914.

However, much depends after all on the local or individual cost of production as to whether a crop will continue to be grown, and the comparative cost will determine whether any district or individual farmer will continue to produce broom millet, or whether any other district or farmer will take up the growing of the crop on a commercial scale. This must be determined by analysis and experiment by the grower himself.

Broom millet, for these reasons, finds its most suitable locations in districts where the conditions are favourable for producing good crops, and where labour conditions, particularly at harvesting, are good, either in the form of skilled contract labour or cheap family labour.

Climatic and Soil Conditions.

The bulk of our broom millet crop is grown on alluvial soils in the districts mentioned. A warm climate and good soils are essential. Districts with too great a rainfall, especially in the autumn, are not favourable, and for this reason the lower parts of the upper North Coast rivers are not very suitable. Low-lying land subject to poor drainage should not be used, as there is too great difficulty in keeping the young crop free from weeds and grass, and encouraging a quick thrifty growth of the young plants.

On the Western Slopes the rainfall is a limiting factor in the production of broom millet. Unless irrigation can be practised, only districts with an annual rainfall of at least about 25 inches are recommended, and the lower the rainfall the more fertile and of greater moisture-holding capacity must be the soil. Even in the Tamworth district, with an annual rainfall of 28

inches, some dry seasons occur in which the crop is almost a total failure. Here it is possible that in normal seasons the rich volcanic upland soils will produce good broom millet, as well as the alluvial soils on the river flats.

Broom millet (which should more properly be called broom sorghum) belongs to the sorghum family, but differs greatly from the sorghums in this respect—that while the sorghums may be grown profitably for fodder on poor soils, a good fertile soil is essential for producing a good yield and quality of broom millet. The crop can be grown on soils less fertile than are required for the production of maize for grain, but the quality and yield decline appreciably as the soil becomes poorer. Broom millet will grow good crops on rich soil on less rainfall than maize, but as just indicated a limit is quickly reached beyond which the crop is considerably affected.

Preparation of the Soil.

The factors of importance in preparing the soil for broom millet are conserving the winter rainfall in the soil, destroying weeds, and getting a good firm seed-bed for quick germination of the seed.

Early and deep ploughing is the first consideration—the earlier the better for receiving and storing as much winter rainfall as possible. The earlier the ploughing or the moister the soil the deeper the ploughing can be (consistent with practicability), for then the soil more easily settles down before planting time. If the land is ploughed before or during the winter, it should be left open in the rough state till early spring.

In early spring the land should be reploughed only if it has become too consolidated or weedy, and should be cultivated or harrowed a few times before planting in order to create a mulch which will conserve the moisture already in the soil. These cultivations also have the effect of consolidating the seed-bed, and of encouraging weed seeds to germinate, to be killed by the subsequent cultivation or harrowing.

In the case of broom millet a firm and clean seed-bed is particularly desirable to secure good germination and to obtain unimpeded growth of the young plants.

Planting.

Like all sorghums, broom millet requires warm weather for its growth, and usually starts off slowly when sown in the spring. For this reason emphasis is laid on killing several crops of weeds if possible before planting, and also on not sowing until the soil is sufficiently warmed up to induce quick germination and growth.

No set time can be given for sowing. This must depend on the seasonal conditions, though after the weather has warmed up in September the best results are usually obtained by sowing in that month or early in October. Sowing may be continued, particularly on the coast, up till December or January, though very little broom millet is usually sown after October or November. The advantage of a September sowing in long-season districts is also that a second crop (ratoon crop) may be grown after the first cutting.

Sowing is made on the flat, or in shallow furrows made with a small plough or with a broad tine on a single horse cultivator. The last method is necessary where the land is infested with "nut grass," the subsequent cultivation gradually filling in the furrows and smothering the weed growth.

The rows are usually 3 to 3½ feet apart, and the plants should be from 4 to 8 inches apart in the rows, depending on the fertility of the soil, the closer planting being made on the richer soils. This planting distance is rather important as it affects the quality of the brush to a large extent. If too much space is allowed, the plants grow very strong and vigorous, and produce brush which is coarse and not of the best market value. On the other hand, if the plants are too crowded very poor, unsuitable branching fibre is produced. In the case of too thick a stand thinning is resorted to, but to save

A section of a Crop tabled.
Note the difficulty that would otherwise attach to harvesting the heads of the standing crop.

this tedious and expensive operation, good, clean, well-graded seed should be sown on even well-prepared land to get about the required stand. Sowing is best done with a maize drill fitted with a sorghum plate, and shallow planting should be the rule. About 3 or 4 lb. of seed per acre are required.

There is practically only one variety of long brush millet grown—White Italian.

Experiments with fertilisers have shown that the yield is not increased very greatly on alluvial soils, but superphosphate applied in the drill at planting at the rate of about 1 cwt. per acre has the effect of stimulating the young growth and giving the plants a quick start. This is especially desirable with early sowing, when broom millet otherwise makes slow growth, and on weedy land, where quick development of the crop has the effect of preventing the young plants from being overrun by weeds, thus saving much hand cultivation at this stage.

On land which has been under cultivation for some time, and which is becoming difficult to work on account of the loss of organic matter, a green manuring crop such as cowpeas, field peas, or vetches, either ploughed in or fed off by stock some few months before planting broom millet, has been found to be highly beneficial. Superphosphate, applied to this green manure crop or to lucerne previous to being ploughed out for broom millet, has been found to be decidedly advantageous to the broom millet crop, greatly increased yields having been obtained as the result of this practice.

After-cultivation.

If heavy rain falls shortly after sowing, the germination will be affected, owing to the formation of a heavy crust on the surface, and the field may require replanting, especially if the seed has been sown in furrows. If sown on the flat, light harrows can be run over the land to break the crust. If done in furrows, this harrowing might cover the seed too deeply.

Brush cut and laid all one way on tables to field cure.

Owing to the slow growth which broom millet makes, especially if sown early in spring, harrowing is one of the most important operations in the cultivation of the crop, as it has the effect of warming the ground and inducing faster growth. The crop may be harrowed till it is 6 or 8 inches high, and this should be done during the warmth of the day when the plants are supple.

The first cultivation is best given with a narrow tine cultivator, working as close to the rows as possible to get rid of the young weeds. It is usually found necessary to go twice up the rows with this first cultivation, and it is required to be done carefully to avoid injury to the young plants. The cultivation should be continued until the crop is about half grown, and should be shallower with each succeeding cultivation to avoid damage to the roots. A double-row cultivator should be used for the later cultivation

on larger areas. The amount of cultivation necessary is determined largely by the rainfall, and the growth of weeds. Keeping down the weeds is the most important object of cultivation.

Harvesting.

The correct time to harvest the crop is a matter concerning which there is no great agreement, even among experienced growers; but it is certain that the best results are not obtained by harvesting in the flowering stage in the endeavour to get a green colour in the brush, which is supposed to be preferred by some manufacturers. The brush is fully developed while the seed is still in the soft dough stage, and it then still has a good tinge of green. This is the stage at which some growers harvest, while others wait until the seed is just firm, when the brush has lost its prime colour but is still tough. The advantage of leaving the harvesting until this later stage is that some value then attaches to the seed, which is becoming increasingly used on the farm, and is also often quoted on the market as a cheap poultry feed. If allowed to go too far, of course, the seed becomes dead ripe and the brush becomes yellow and dead, and loses its value altogether for manufacturing purposes.

The practice of bending the head over is one which used to be carried out by some growers in order to avoid the brush becoming bent and scraggy in appearance, and also to facilitate harvesting on account of the great height of the heads from the ground. The practice has now largely disappeared, and has been superseded by a more rapid and efficient method called "tabling," which not only makes harvesting easier, but helps considerably in the drying and subsequent handling.

This "tabling" method has been developed and is almost generally used by Manning River farmers, and the practice is spreading to other districts where broom millet is grown. Mr. J. M. Pitt, Senior Agricultural Instructor in the Lower North Coast district, describes the method as follows:—"The farmer, bending two rows at the one time, places each row diagonally across each other, forming a latticed table about 3 feet from the ground. The work is done by the operator facing the direction of tabling (*i.e.*, walking backwards as the work is done.) He is then in a position to place the heads near the outside edges. The final operation of cutting is carried out by walking along the passages between the tables, and removing the head with about 6 inches of stalk, with a butcher's or some other suitable knife. The sheath enclosing the stem is removed at the same time. Besides hastening the process of drying, the removal of the sheath allows the reddish discoloured area to dry out better, and it also deprives aphis of shelter. The heads are then placed in moderately thin layers on the "table" to dry, which usually takes from 36 to 48 hours according to the weather and the maturity of the crop."

The accompanying illustrations (supplied by Mr. Pitt) show the method of tabling described.

In order to retain some of the colour when the harvesting is in any way delayed, the final drying is best done under cover, away from the direct rays of the sun, in a shed fitted with racks or open shelves, on which the brush is placed in layers from 3 to 12 inches deep, depending on the amount of moisture still being held by the heads. Curing takes longer in the shed than in the field, and may require attention in turning the layers over from time to time. Thorough drying is advisable, because hackling is rendered easier and the seed being more thoroughly dried is less liable to heat in storage, which is a common occurrence with broom millet seed, harvested as it is mostly in an immature stage.

Box press filled ready to be pressed

Hackling.

The brush is prepared for market by the removal of the seed. This is done by means of a hackling machine, which consists of a roller studded with small, narrow iron spikes mounted in a drum or concave, and turned speedily by hand or belt power. The brush is not fed into the machine, but is held in small handfuls into the machine so that the upper part of the brush containing the seed comes in contact with the roller, which strips the seed off clean.

A firm at Morpeth, on the Hunter River, specialises in millet machinery, and supplies hacklers for hand or belt power for about £5. Many farmers have home-made hacklers, which well serve the purpose for small crops. One enterprising farmer on the Manning River drives his home-made combined hackler and winnower (to get rid of the dust) by power.

After hackling, the brush should be packed back in deeper layers on the shelves, and with all butts level, to cure further until baling time. This latter provision is an advantage in further handling at baling time.

Baling.

Grading is a process that farmers seldom practice, the millet being put up into bales which are called "self working," being composed of all grades—"insides," "covers" and "hurl," and bent and inferior brush. Grading on the farm into separate bales involves much extra labour, and the growers

contend that the extra price received for the graded article is not sufficient to justify grading. At the same time. a rough grading out of all millet, which does not come up to the manufacturers' requirements, is usually worth while and is reflected in a sufficiently increased price to justify the practice.

A lucerne or hay press can be adapted for baling broom millet. The best type is a box press (resembling a wool press), which keeps the butts even. The brush is laid with butts outward and the heads overlapping in the centre. A good pressure is desirable to reduce the bulk for the saving of freight on rail. Battens are placed on the top and bottom of the bales, which are secured by four to six strands of stout wire. A convenient size of bale is about 46 x 30 x 24 inches, weighing about 300 lb.

TRANSPLANTING OF ORNAMENTAL BUSH TREES.

"WOULD you please forward me information as to the correct method, time, &c., of transplanting half-grown ornamental bush trees such as kurrajong, wilga, &c."

The writer of the foregoing was informed that the seed of such hard-wooded native plants as wilga, myall, &c., should be sown as soon as ripe in pots, tins or pieces of bamboo, and that they can then be transplanted to the desired position at any time of the year immediately following a soaking rain. Transplanting bush or open ground nursery plants at any time is not recommended, as one is likely to lose at least 90 per cent.

Kurrajongs should be sown in nursery rows and transplanted to where they are to be grown three years from the time of sowing. Transplanting should take place immediately after rain, care being taken to lift and plant the whole of the tap root.—E. N. WARD, Superintendent, Botanic Gardens, Sydney.

BARLEY FOR MALTING.

BREWERS are very particular in the purchase of barley for malting, and demand that every care shall be taken in the harvesting of the grain. It is preferred that the crop be stacked some time before threshing, in order that the grain may mellow and give a more even germination than is the case when harvested by use of the stripper. With proper threshing machinery the length of awn remaining on the seed can be better regulated, a matter of importance in view of the fact that barley devoid of awn is useless for malting purposes. As a preventive of covered smut the seed should be placed in a heap and sprinkled with 1 per cent. solution of formalin, covering the wet heap with bags for four to six hours, so that the vapour penetrates the mass. The seed is then dried, and sowing carried out soon after treatment in a moist, well-prepared seed-bed. If the seed-bed is on the dry side, the treatment is not advised, as it may have a harmful effect upon germination.—A. J. PINN, Special Agriculture Instructor.

Farmers' Experiment Plots.

WINTER GREEN FODDER EXPERIMENTS, 1923.

Yanco Irrigation Area.

A. N. SHEPHERD, Senior Agricultural Instructor.

THE following farmers co-operated with the Department in the conducting of green fodder trials during the winter of 1923 :—

Mr. W. Edwards, Farm 367, Leeton.
Mr. W. Playford, Farm 336, Leeton.
Mr. J. Oslington, Farm 363, Leeton.

The plots were sown one in March and the others in April, sowings being followed by a dry spell, which necessitated irrigation in May. After the breaking of the dry weather in June, an abnormally wet period was experienced for practically three months. During this time much of the crop received too much rain, but although at times water accumulated on the surface of the crop, the most damage resulted to the barley on the farm of Mr. Oslington. Odd patches of oats and wheat may have scalded, but not to any extent. Compared with what might have been expected during so wet a winter, very little frost was recorded. The rainfall registrations were as follows :—April, nil; May, 92 points; June, 533; July, 233; August, 127; September, 151; total, 1,136 points.

The Plots.

Farm 367.—A manurial trial was conducted here with Sunrise oats and vetches, sown at the rate of 1½ bushels and 20 lb. per acre respectively. The plots consisted of red clay soil, on which trials had been conducted the previous season with similar fertiliser mixtures. The land had been fallowed since the previous spring, and was irrigated and cultivated previous to sowing on 23rd March. Splendid germination was obtained, and following the irrigation in early May the crop made good growth. The two plots fertilised with superphosphate showed to advantage throughout the trial. The excessive rain helped materially to reduce the yields of those plots manured with M6 and P7 mixtures, due to the water lying on the surface and scalding the crop.

The yields were as follows :—

	t.	c.	q.	lb.
Superphosphate, 140 lb. per acre ...	7	12	2	0
Superphosphate, 70 lb. per acre ...	7	10	0	0
M5, 105 lb. per acre	6	9	3	0
No manure	6	2	0	0
M6, 91 lb. per acre	5	16	2	0
P7, 63 lb. per acre	5	8	0	0

Farm 363.—A variety trial (consisting of six plots in all) of wheat, oats, and barley in combination with vetches was carried out on this farm. The plots were sown on red clay land that had previously grown oats without manure. Sowing took place on 9th April, with oats at the rate of 1½ bushels, barley

1 bushel, wheat 1 bushel, and vetches 20 lb. per acre, superphosphate being applied at the rate of 70 lb. per acre. This land was ploughed in February, and irrigated and cultivated previous to sowing. A good germination was obtained. The crop was irrigated on 26th April. The winter rains scalded the barley so badly that the weights of the crop were not comparable and were not taken. Mulga oats did very well, attaining a height of well over 6 feet, and the wheats also did very well, showing practically no rust, despite such a wet season. Yields :—

	t.	c.	q.	lb.
Sunrise oats and vetches	6	12	0	0
Clarendon wheat and vetches	6	11	2	0
Firbank wheat and vetches	6	16	3	0
Mulga oats and vetches	7	16	3	0

Farm 336.—The land on which this plot was sown consisted of heavy red clay. The trial was similar to that on Farm 363, except that Guyra oats was used instead of Mulga. The seed was sown on 12th April, superphosphate being used at the rate of 70 lb. per acre. This land had originally been sown to lucerne, which made such poor growth and such a thin stand that it had been used only as a grazing paddock, not warranting cutting. Only a fair germination was obtained, but the crop made good growth following irrigation in May. The Trabut barley made very fair growth, although affected by too much rain. Yields :—

	t.	c.	q.	lb.
Guyra oats and vetches	5	19	3	11
Sunrise oats and vetches	5	15	2	0
Trabut barley and vetches	4	4	0	5
Clarendon wheat and vetches	4	4	0	0
Firbank wheat and vetches	4	3	2	7
Cape barley and vetches	4	3	0	14

Comment.

In the variety trial, although the wheat was a week to ten days earlier than the oats, the latter gave the heavier returns. In dry winters it is possible—though not recommended if the settler has any means of conserving the fodder as silage or can cut and feed green—to feed the crop off, but during such a winter as that just experienced it was impossible to allow stock on the land; in fact, it was almost impracticable to cut the crop, so wet was the soil. Thus there is brought very forcibly before the settler the necessity of fodder conservation in the form of silage, as provision against such a season as well as against droughty times.

The land selected for these trials is similar to the large majority of the dairy farms of the area, and it is evident that by the selection of suitable varieties and with average care and attention good yields of fodder are obtainable, either to be fed green or conserved as silage.

It was clearly demonstrated that barley growing on these lands—in wet seasons, at all events—is not to be commended if the early-maturing varieties of wheat and oats are available. On the better class land, however, Trabut barley should give good returns of early feed.

The vetches grew very well throughout the plots, greatly enhancing the feeding value of the fodder, as well as increasing the yields.

Central North Coast.

J. M. PITT, Senior Agricultural Instructor.

EXPERIMENTS with winter fodders were carried out in co-operation with the following farmers :—

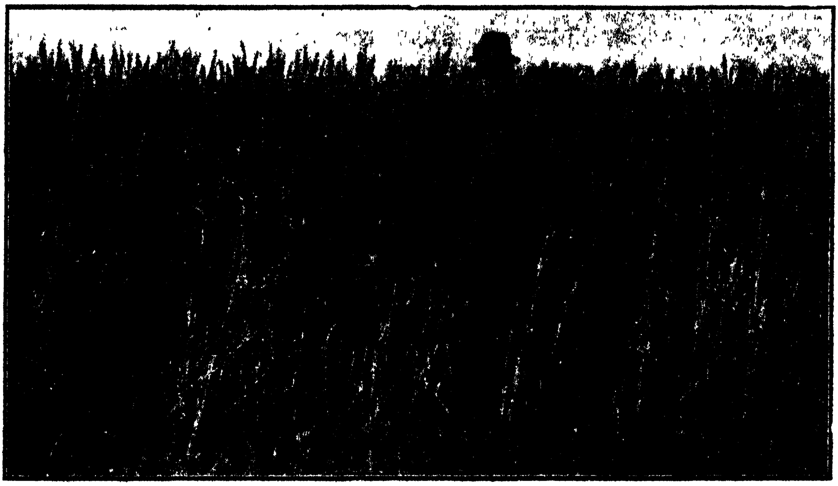
H. Wedlock, Frederickton, Macleay River.
D. Dornan, E. Frederickton, Macleay River.
J. G. Ward, Sherwood, Macleay River.
J. J. Webster, Glenrock, Macleay River.
B. Allan, Oxley Island, Manning River.
B. Richardson, Dumaresq Island, Manning River.
A. Longworth, Ghinni, Jones Island, Manning River.
Weller and McLeod, Mondrook, Manning River.
Dempsey Bros., Taree Estate, Manning River.
G. Levick, Taree Estate, Manning River.
J. Lambert, Taree Estate, Manning River.
A. M. Hooke, Taree, Manning River.
H. Flett, Taree, Manning River.
J. Campbell, Wingham, Manning River.
D. Cameron, Mt. George, Manning River.
A. H. Norris, Mt. George, Manning River.
R. Richardson, Tinonee, Manning River.
P. McCaffrey, Taree Estate, Manning River.
J. P. Mooney, Dumaresq Island, Manning River.
Alex. Smith, Bandon Grove, Chichester River.
M. Smith, Paterson.
S. Ebbeck, Vacy, Paterson River.
T. Pearse, Hinton, Hunter River.
R. Apps, Miller's Forest, Hunter River.

In addition to the very large increase in the number of farmers co-operating with the Department in winter fodder growing, on no previous occasion has the acreage sown to this class of crop on the Central North Coast been approached, and the excellence of the crops, especially those of Sunrise oats, was commented upon on all sides. Owing to the fact that the previous summer and autumn were remarkable for their dryness, there being almost a total absence of any class of fodder, farmers were faced with one of the blackest outlooks on record; consequently the sowing of winter crops for late winter and spring use became almost imperative.

Apart from this, however, the increased cropping was due partly to the enthusiasm displayed by farmers for all classes of experimental work, especially where the branches of the Agricultural Bureau are live organisations. Even the farmer who has refused, so far, to consider fodder crops now shows a keen desire to dabble in the newer crops—a fact largely accounted for by the encouragement given by local agricultural societies in offering substantial prizes for Bureau exhibits—as instanced by the Lower Manning and Maitland associations.

The rapidity with which Sunrise oats has gained in popularity during the last couple of years now places it ahead of all other winter fodder crops. Its earlier maturity when compared with Algerian, its enormous yielding capabilities, and its leafiness and succulence have firmly established it with

dairymen. The yields obtained during the year were the heaviest yet recorded on private plots. Crops over 8 feet in height and yielding many tons in advance of those in the table were seen. Sheaves from these farms



Canberra Wheat at Tinonee.

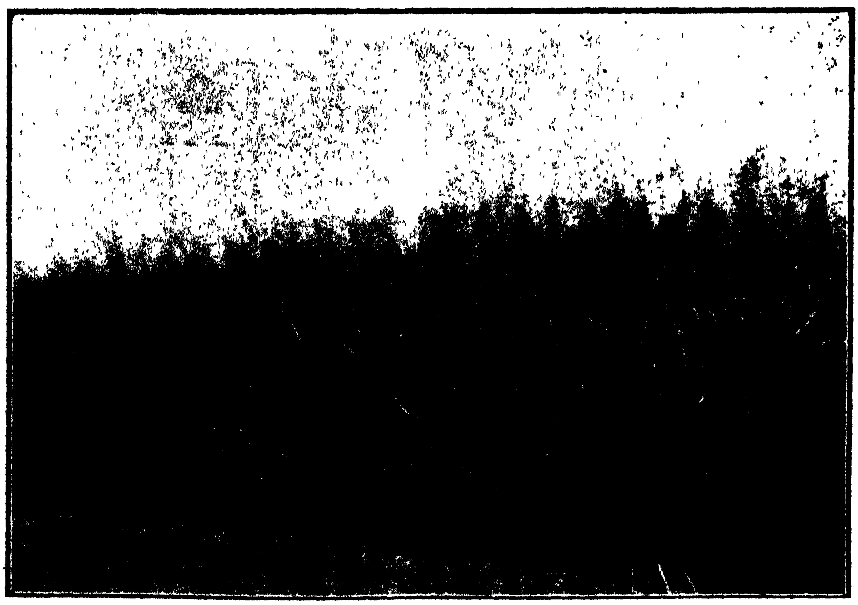
Sunrise Oats, over 6½ feet high, at Taree Estate.

have been secured for the local and the Royal shows. Of the newer varieties, Mulga and Yarran showed up prominently. They closely resemble Sunrise in type of fodder produced, but with a slight variation in maturity.

Of the wheats, Florence is very popular, chiefly owing to its early availability. Currawa, although rather late, has again given satisfactory results. In spite of its somewhat disappointing appearance during early growth, it

turns out a very palatable fodder, being more leafy and having more succulent stems than the usual run of wheats. It is owing to their sparse leafing and thinnish stalks that the majority of wheats are not popular with dairymen. Currawa to a certain degree overcomes that failing.

Guyra Oats at Vacy.



Yarran Oats at Mondrook.

YIELDS of

Variety.	D. Cameron, Mt. George.	S. Ebbeck, Vacy.	H. Flett, Taree.	J. Campbell, Wingham.	A. M. Hooke, Taree.	J. Lambert, Taree Estate.		G. Levick, Taree Estate.	Dempsey Bros. Taree Estate.
Date of Sowing.	18 April.	14 April.	17 March	26 June.	22 May.	22 March.	14 April.	19 March.	17 April.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Barleys—									
Kinver	8 16 1	...	.	...	...	..	...	...	...
Skinless	9 10 0	6 10 0	..	...	..	..	...	8 18 2	...
Malebo	11 6 3	...	...	..	...	...	...	8 2 3	...
Reka	9 12 1	...	...	..	...	...	...	12 8 2	...
Pryor	9 9 0	11 8 2	...	...	...	...	...	9 17 0	...
Trabut	...	18 8 2	...	...	...	...	...	10 2 3	...
Trabut and peas ..	...	...	...	...	...	..	...	...	...
Cape	8 2 0	11 5 3	...	...	...	..	..	7 17 0	...
Cape and peas ...	...	...	...	...	...	...	...	...	...
Stanwell	...	...	...	...	...	...	...	11 1 1	...
Wheats—									
Currawa	...	13 15 2	8 2 0	10 0 0	...	16 15 0	13 14 2	...	16 0 0
Florence	...	...	9 12 3	9 18 2	...	10 5 3	10 18 2	...	14 12 3
Gresley	...	...	9 12 3	10 12 2	12 6 0	...	...	...	...
Gresley and vetches.	...	...	..		...	..	...	...	...
Waratah	...	..	..	10 10 1	..	...	...	...	...
Clarendon ..	...	..	..	10 12 2	...	...	...	...	15 8 2
Canberra ..	..	.	...	11 2 0	.	.	.	...	..
Bomen	...	...	...	...	...	15 14 0	16 2 0	..	...
Warren	...	...	...		...	...	...	...	..
Bomen and vetches	..		.	..		...	..	...	...
Warden	...	..	..	.		..	.	...	...
Riverina	..	..	.	...		...	...	..	...
Oats—									
Quondong and peas	...	...	...	.	...	...	...	...	...
Yarran	...	...	...	...	19 1 0	...	...	...	...
Yarran and peas.	...	...	...	..	...	..	...	...	...
Yarran and vetches.	...	...	...		...	...	...	...	...
Mulga	...	..	..	...	16 3 0	...	...	...	...
Mulga and vetches	...	..	...	...	...	...	...	...	..
Guyra	...	19 18 2	16 2 2	...	15 16 2	...	...	...	...
Guyra and vetches	...	..	...	...	...	...	...	...	..
Algerian	...	14 0 0	...	...		...	...	...	22 0 0
Algerian and vetches.	...	...	...	..	...	...	...	...	...
Algerian and peas	...		...		...	...	...	...	...
Sunrise	...	16 17 0	...	9 18 0	20 11 2	23 16 2	19 8 0	11 18 0	19 18 0
Sunrise and peas ..	...	...	16 4 2	...	...	...	...	...	...
Sunrise and vetches.	...	16 17 0	17 3 2	...	...	...	...	...	..

Green Fodders.

McLeod and Weller, Mondrook.	J. P. Mooney, Dumaresq Island.	A. H. Norris, Mt. George.	T. Pearse, Hinton.	B. Richardson, Dumaresq Island.	R. Richardson, Tinonee.	M. Smith, Paterson.	J. G. Ward, Sherwood.	J. J. Webster, W. Kempsey.	R. Allan, Oxley Island.	A. Longworth, Ghinni.
16 April.	18 May.	28 April.	19 April.	15 May.	7 May.	2 May.	4 May.	7 May.	15 May.	26 June.
t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
...	...	...	...	...	...	...	.	..	..	...
...	...	9 8 2	...	...	...	..	...	.	...	...
...	...	...	...	...	...	...	.	..	.	...
...	...	..	...	...	...	...	...	...	..	...
...	...	...	...	...	...	...	...	...	..	...
...	...	7 17 0	...	16 0 2	...	...	...	...	...	...
...	...	...	.	16 15 0	...	...	..	...	...	...
...	..	8 11 3	...	13 10 2	...	...	..	...	...	...
...	...	...	..	16 7 3	...	...	...	...	...	...
...	...	..	...	...	...	...	..	...	...	...
13 5 3	13 14 1	..	12 18 1	14 15 2	17 5 0	12 17 0	14 14 1	15 0 0	9 17 0	9 12 0
12 2 0	13 2 3	13 6 0	13 7 0	15 13 0	15 8 0	12 2 3	15 10 0	17 14 1	9 17 0	7 17 2
...	...	...	...	...	...	...	17 1 1	14 2 3	...	...
...	...	..	...	..	...	...	18 5 0	...	...	...
9 12 3	...	..	..	..	...	..	...	..	...	...
...	...	13 7 2	12 9 2	...	16 15 0	11 1 1	...	15 8 2	...	...
...	...	...	...	...	12 17 0	...	...	11 0 0	...	...
...	...	...	11 18 1	...	...	...	...	...	...	...
9 2 3	11 14 1	...	...	...	...	...	...	...	..	..
...	...	...	13 12 3	..	..	...	...	..	...	...
...	...	...	.	..	14 1 0	...	...	...	...	...
10 5 3	..	...	..	..	...	..	...	...	...	...
...	...	12 17 1	..	...	..	..	...	...	...	...
...	...	...	...	.	...	...	14 14 0	..	...	...
12 4 1	...	11 19 2	...	...	...	...	...	...	...	...
13 18 2	...	...	...	...	17 10 0	...	...	...	...	...
...	...	...	...	...	...	...	..	...	...	...
15 0 0	...	...	...	...	...	..	..	...	..	...
...	17 8 2	...	14 8 3	...	..	...	14 14 1	...	..	...
...	...	11 13 0	...	...	..	...	...	...	..	...
...	...	...	...	...	18 18 0	...	13 18 2	..	10 5 2	...
13 12 3	...	9 7 2	...	...	15 2 0	...	...	...	...	...
...	...	...	...	...	...	...	16 14 0	...	...	...
...	19 2 0	14 5 3	15 13 2	...	15 2 0	19 5 3	16 14 4	17 8 2	10 0 0	17 1 0
14 17 0	...	14 8 3	...	...	16 0 0	...	17 17 1	...	...	...
...	...	14 1 3	16 14 3	...	18 5 0	...	19 12 2	18 7 0	...	...

In the Hunter River district Bomen has given good results. The farmer, commenting upon this variety, stated that his cows have for three seasons showed a marked preference for it, even where oats are also grown. Gresley, Canberra, and Clarendon gave good yields, but they are very deficient in leaf.

The barley plots proved an eye-opener to those farmers accustomed to the better known Cape and Skinless varieties. The latter, although coming into maturity early, becomes so rusted that its value as an early winter fodder is considerably reduced. So outstanding have the yields of the newer introduced varieties been, especially Trabut, Pryor, Reka and Stanwell, that there is a keen desire to have the experiments repeated. The Trabut and Pryor type of barley, with abundance of leaf and fine succulent stems, attracted considerable notice. Barley was formerly regarded as one of our best milk-

Clarendon Wheat at Mount George.

producing fodders, but the rather poor results from Cape and Skinless of late years have caused them to go out of favour. Perhaps the newer types may prove more attractive.

In the mixed plots, wheat and oats with a legume, with the exception of a few plots, increases in yield were not so common as in previous seasons. This was due mainly to the failure of the vetches—a wilting disease being fairly general throughout—and to caterpillars devouring the field peas.

In a top-dressing experiment conducted by Mr. Alex. Smith, Bandon Grove, some excellent results were obtained by the use of superphosphate. The table shows that with an application of ½ cwt. to the acre during the early stages of growth an increase of from ¾ to 1½ tons per acre was obtained, and where a further application of ½ cwt. of superphosphate to the acre was

given still further increases were obtained. Such remarkable figures in an adverse year should be borne in mind by all interested in the use of fertilisers.

YIELDS of Fertiliser Trials.

Treatment.	Sunrise Oats.			Sunrise Oats and Tares.		
	t.	c.	q.	t.	c.	q.
No fertiliser	13	6	2	14	2	3
Superphosphate, ½ cwt. per acre	14	14	2	14	19	2
Superphosphate, ½ cwt. early in growth and ½ cwt. extra six weeks later	16	17	1	17	6	3

The Season.

No doubt the excellent yields in the majority of plots were the result of (1) the sweetening effect of the dry spring, summer and early autumn, and (2) the extra cultivation given those plots which were sown on land that had previously been prepared and sown for summer cropping, but on which the crops had failed.

Apart from a fairly wet April, the rest of the winter months were mild, and sufficient rain fell to satisfy the needs of the growing crops. The rainfall was fairly even throughout the Coast.

1923.	Sherwood.	Taree.	Vacy.	Hinton.
	points.	points.	points.	points.
April	842	1,078	......	345
May	9	100	16	11
June	135	205	242	460
July	217	360	237	160
August	269	495	24	126
September	110	172	236	......

The plots of Messrs. P. McCaffrey, D. Dornan, and H. Wedlock were not weighed, owing to change of ownership in the first case, and unevenness in the latter two. Mr. Dornan's plot was exceptionally good in patches. Mr. R. Apps fed his plot off, and the weights were not kept.

SMUT IN OAT GRASS.

THE prevalence of smut in oat grass was remarked upon by a correspondent recently, the issue being raised whether crops of wheat in the vicinity of smut-infected pasture would not tend to become infected also. It was stated in reply that although oat grass (*Avena elatior*) is sometimes affected by the ordinary oat smut fungus (*Ustilago avenæ*), it is not generally considered to threaten spread of the disease. Where necessary, smut in oats may be controlled by any of the recognised seed pickling methods. The smuts which appear on other grasses, as well as those which occur in wheat, are entirely distinct, and have no connection with the oat grass smut.—R. J. NOBLE, Principal Assistant Biologist.

TREATMENT OF FINE CLAY SOILS.

"UNDER separate cover I am forwarding you a sample of soil. I would like to know if it is suitable for growing wheat, and what kind and quantity of fertiliser to use. The ground from which the sample has been taken was fallowed early in September, harrowed twice, and disced once."

In response to the foregoing inquiry it was stated that examination of the sample of soil submitted showed a somewhat unsatisfactory physical condition to be its principal defect. From a chemical point of view the soil was fairly good and in this respect quite suitable for wheat, but owing to its fine clayey nature and tendency to set hard it was likely to get into a condition which would prevent satisfactory growth. If, however, the soil was worked in the right way, good yields of wheat should be obtainable from it.

The type of soil referred to does not give the best results in dry seasons, while in very wet seasons it is likely to become water-logged and to adversely affect the growth of the crop. In working it, every effort should be made to keep it in a fairly rough condition. Worked down fine, it is liable to set very hard. Disc implements should therefore never be used, except when they are absolutely necessary on account of rubbish. Mouldboard ploughs are the most satisfactory for ploughing, while for surface working springtooth cultivators should be used. Such soil should not be worked while in a wet condition. Lime and gypsum improve this class of soil, but their extremely high cost prohibits their use. Superphosphate was recommended at the rate of 80 lb. per acre.—A. H. E. McDONALD, Chief Inspector of Agriculture.

THE WATER SUPPLY IN THE FARM HOUSE.

A MOTOR truck with a specially constructed extension platform top, loaded with an exhibit of pumps, plumbing equipment, tools, and demonstrating materials related to household water supply installation, left the offices of the Canadian Department of Agriculture recently to tour Western Ontario. This demonstration on wheels (says the *Agricultural Gazette of Canada*) was prepared under the direction of the Superintendent of Women's Institutes for the purpose of illustrating to the people of the rural districts the best way in which to install or improve the household conveniences so necessary in the reduction of labour in the farm home.

Farm surveys have shown, says the *Gazette*, that too few farm houses are equipped with any water service, and that many are not taking advantage of the natural conditions that surround them. Carrying water from a spring when either a gravity line or a hydraulic ram would deliver a water supply at a kitchen sink is a waste of time and energy still being practised. The insanitary cesspool is also still used, in spite of the fact that the septic tank is known to many, and is a convenience within the reach of all.

The remarks have a significance for the Australian as well as the Canadian farmer, for although conditions here are not always comparable, and although (in our dry west, for instance) conservation of water for domestic purposes is usually far from a simple problem, many of our farmers are without doubt so circumstanced that household facilities in this and other directions should be far less primitive than they are.

Silage an Essential to Successful Dairying.

WHAT TILBA FARMERS SAY AND DO.

W. H. BROWN, Editor of Publications.

So much has been written on the subject of silos and silage—so much about the best class of silo—so much about the value of fodder conserved in this way—so much about the crops that can be used for the purpose—that the question may well be asked, is there anything new to be said about it ?

We have had described in great variety the types of silos that can be used under different circumstances. We have had the undeniable advantages of silage as an emergency fodder presented in a score of ways, until everyone thoroughly assents to the proposition that it will carry a herd of cattle or a flock of sheep through a dry spell. We have even had the testimony of individual farmers to satisfactory results. Yet somehow we would value as additional to all this the evidence of a group of farmers who have adopted this method of conserving fodder as a regular feature of their farming. We seem, in other words, to need the conviction that would be carried by a farm method in which silos and silage—instead of being isolated and detached from the routine—are an integral and recurrent part of the system.

To some farmers it is perhaps news that there is a district of which that is all true—that there is a district where fodder is grown every year with the specific intent that it shall be conserved as silage, where it is systematically stored in proper structures, and where it is fed out to the cows according to a well established routine.

In the little district of Tilba on the South Coast—250 miles south of Sydney and 40 miles north of Bega—the thirty or forty farmers who serve the local factories have something like three silos to every two farms. Approach this charming spot from whichever side you will, the first farm possesses its silo, and as you depart tall solid towers seem to bow you out. The farmer who does not possess at least one silo is hardly to be found. Perhaps he is there, but he is out of line, and cannot but know it.

Where Everyone has a Silo and Uses it.

Silos there have been at Tilba for a good many years. There are some in the district that are not less than twenty years old, but as an accepted feature of local dairying the silo may be said to be ten or twelve years old. Nor is there any suggestion that anyone is growing tired of the business. Experience has taught the farmers of Central Tilba and Tilba Tilba (for there are two townships with a certain amount of local rivalry and each disposed to get ahead of the other if it can) that silage is not only profitable but essential to successful dairying, and everybody fills his silo or silos every year. Such a thing as an unused silo is unknown there, and when a silo grows old and loses its usefulness

(for such things happen) it is immediately replaced. In fact, so highly is the system esteemed that even now there is a certain feverish anxiety to erect more silos, and men who have had one and two are realising that not only must they have enough silage for a winter, but they must have yet further reserves against prolonged spells of dry weather.

In the presence of facts like these one's thoughts travel to other districts, where the silo is just as strongly approved as an excellent thing, but where the method has never become a feature of farm life as it has at Tilba, and the question arises, "Why ?" One recalls other silos that have been erected in good country with no small acclamation, and that were filled—hardly with so much acclamation. "To tell the truth there was a good bit of work about it," the farmer told his friends afterwards. "The crop was heavier to handle than we expected. It had to be lifted on to the dray in the paddock, and then had to be handled again at the cutter, and altogether we were a bit fed up with it when we got it in. And then it was not too well packed, I suppose. At any rate, there were a good few mouldy patches in it when we opened it up. Altogether we were not quite so enthusiastic when we had finished as when we started. But the real trouble began when we came to feeding the stuff out. The feeding stalls were 20 to 30 yards from the silo, and when you have to carry 20 or 30 lb. of fodder for forty to fifty cows once or twice a day for two or three or four months it means an awful lot of work. We did it one year, but we have not bothered about it again. Too much work in it for us!"

More or less accurately that expresses the attitude of a good many farmers—even of men who have silos on their farms.

But one hears no such story at Tilba. There every silo is filled every year, and the fodder is as systematically used every year, and (as stated above) more silos are actually being erected at the present time.

And the secret ? It was discovered to the present writer during a recent visit to Tilba, where, under the kindly pilotage of Mr. H. J. Bate, of "Mountain View," Tilba Tilba—himself a successful dairy-farmer and a silage enthusiast—a number of farmers were interviewed and their plants inspected. Gathered into a sentence Mr. Bate attributes the success of the silo at Tilba to the adoption of labour-saving methods at every stage of the business, and he was able to furnish any amount of proof to that effect, generously devoting two days to our quest for information, and himself furnishing much valuable material for this article.

The proper construction of the silo is, in the opinion of Tilba men, only one aspect of the matter. They have learned that the crop must be handled in the most economical and expeditious way from the paddock to the silo, and from the silo to conveniently situated stalls, and they have adopted methods and devices that have contributed to that end. A disposition to benefit by each other's experience, and a little healthy rivalry, perhaps, have enabled them to evolve a system which has made ensilage an essential, profitable, and convenient part of their farm method.

How Tilba Stood the Drought.

"What would you say to dairying without silage," Mr. Bate asked one farmer during our tour.

"You couldn't do it. You'd have to close down," was the emphatic reply of one to whom this fodder—"only roughage" as we are sometimes told—had become a necessity.

"My cheques are bigger in the winter than in the summer," another told us. And he added that his 220 acres are producing over £2,000 per year, a result that is attributable to silage.

The recent drought furnished a wonderful illustration of the value of silage. On the lower South Coast the losses of stock were exceedingly heavy, as many as 30 to 40 per cent. being reported in too many cases. The dry period was so prolonged that even in Tilba stores of fodder gave out in some cases and supplies had to be purchased, but the significant thing is that the losses did not exceed 1 per cent.—in fact, most farmers actually made more money during the worst of the drought than at any other time. One actually produced his accounts to show that during the months of July, August and September last, when the drought was about at its worst, and when many men in other parts were suffering heavy losses, his 180 acres of hill country, with fifty or fifty-five milking cows, and the pigs, earned for him nearly £700.

One of the local cheese factories made 133,000 lb. cheese in the March-September half-year of 1923, against 201,000 lb. in the same period of 1922, and with the assistance of the increased price of cheese and some savings in manipulation and carriage, the directors actually paid the suppliers £50 more in the March–September period of 1923 than in the same period of 1922.

To the details of some of the methods that give such returns we may now turn.

Maize is the Crop.

The soils of the district, chiefly of a heavy, dark type, in places becoming sticky, have been formed from basaltic rock which has been intruded over a limited area upon the surrounding silurian. Set in the midst of poor country, Tilba is to the traveller as an oasis in a desert, its natural beauty making a clear welcome contrast to the spotted gum ridges north and south of it.

Maize is universally grown for purposes of silage-making. In fact, it is hardly an exaggeration to say that pasture and maize occupy the whole area. A few small stands of lucerne are to be seen, the value of that excellent fodder crop being evidently known, but as a factor in local practice it can hardly be counted. Maize is unanimously preferred, and on all hands in the latter part of January were to be seen luxuriant, well-grown crops which promised to yield up to 30 tons of green fodder per acre. That other crops serve quite well for silage purposes is fully admitted, but experience has shown that nothing else gives such weight of fodder per acre, and it is found quite

simple to improve the quality of the ration, if necessary, by adding some concentrate Maize, therefore, is everywhere, and any quantity of it, and grown as near to the silo as reasonably possible to reduce haulage.

That everything is concentrated upon minimising labour was emphasised again and again during those few days at Tilba. Even under the best of

A Fine Crop of Fitzroy Maize on the property of Mr. H. J. Bate, Tilba Tilba.

It was expected this crop would yield well over 30 tons of green stuff per acre.

conditions handling charges must be reduced. With this in view a good deal of importance is attached to everything that will increase the weight of the crop. The best of varieties, the best of the land, and the best of cultural methods are factors that contribute to yield, and all receive full attention.

Except in a few isolated patches, no grain is harvested, but the crop is treated with as much care in every detail as if it was intended to produce prize cobs. Such a thing as broadcasting the seed because the crop is "only for silage" would not be entertained. A crop that yields any quantity of fodder of the best quality is the objective, and it is never lost sight of.

Fitzroy is the variety most generally favoured. It was recommended by the Department of Agriculture, and it has not only proved a heavy producer, but it is slow in maturing, and remains green for several weeks after it has reached full growth, so that the farmer has ample time in which to harvest the whole crop while it is still in a succulent condition. A few farmers us the heavy white varieties like Giant White and Hickory King, and there are those whose preferences are for Red Hogan and other types. Whatever the variety, however, all know the value of good, clean, sound seed, and take care to get it.

The question of maintaining soil fertility is beginning to occupy attention at Tilba even though superphosphate has been in use. Farmers have been growing silage crops on the better paddocks near the homestead for some years and they begin to realise that it cannot go on indefinitely. So far there is no talk of diminished yields, but there is a recognition that the wonderful yields that have been associated with the use of 1 cwt. to 2 cwt. superphosphate per acre may have an end. Nearly all are now adding a little bonedust or blood and bone, but it is fully admitted that even that is not the last word, and the possibility of occasionally laying down the cultivation paddocks with a legume which could be used to renovate the soil is discussed here and there. It is a healthy sign, and another evidence that with progressive farmers sound methods in one direction are usually associated with a desire to be sound also in other respects.

The drills are usually 3 feet to 3 feet 6 inches apart, and the seed is sown fairly thickly in the drills, a plate being generally used in the sower to get a thicker sowing. It is the practice to harrow the ground thoroughly when the crop is coming up, in order that hand chipping may be avoided as much as possible. The horse hoe or scuffler is used continually until the crop is too tall for the horse to work comfortably in it. The cleanliness of the crops in the district is notable, the more so when the strength of the soil and the "growthiness" of the present season are considered.

When to Cut and Why.

The next point emphasised is that the crop should be cut at the right stage. The silage is of little value if it is sour and unpalatable to the cattle, and while succulence will be lost if the crop is allowed to stand too long, on the other

hand an inferior silage is obtained if it is cut too soon. It is well known that when green forage is packed tightly into a silo, certain fermentations take place, during which much of the sugar in the forage is broken down into certain acids (chiefly lactic and acetic acids). So soon as the sugar in the forage has been changed into these acids the fermentation is checked. Hence a crop containing little sugar will make a less acid silage than a crop with more sugar. As an immature maize crop contains more sugar than a well-matured one and will therefore make a more acid silage, it is important that the crop be not cut too soon. Some farmers at Tilba have rather inclined to cut on the early side, in order to save the crop in its most succulent form, but Mr. Bate himself prefers to wait until the grain has become slightly dented, as the silage seems then to have the maximum feed value for milking purposes and at the same time to be most palatable.

The extreme suitability of Fitzroy may again be mentioned, in view of the time it remains in a condition suitable for ensilage after it has reached maturity.

Various methods of cutting have been tried, but nowadays the men are provided with large cane knives. With these they cut the stalks off short, throwing them into heaps with the cut ends all one way.

How Tilba Draws the Forage in.

It is at the next stage that Tilba farmers have introduced one of those labour-saving items which have such important relations to their whole practice.

As in other places, all sorts of means of carriage were tried years ago—ordinary farm drays, tip drays, waggons of different kinds, many sorts of slides—but all of them meant labour and excessive handling and lifting. By adopting every improvement that experience suggested and profiting by one another's ideas, Tilba farmers have evolved a sort of two-wheeled trolley on which rests a large low platform that carries the heavy loads of fodder from the paddock to the silo, and that lends itself in a highly convenient manner to the expeditious handling of the material at the cutter. Anything more thoroughly suited to its job and more economical of labour (to say nothing of money in the making of it) could surely not be imagined. The efficiency of the implement is proved by every farmer owning two and some of them three.

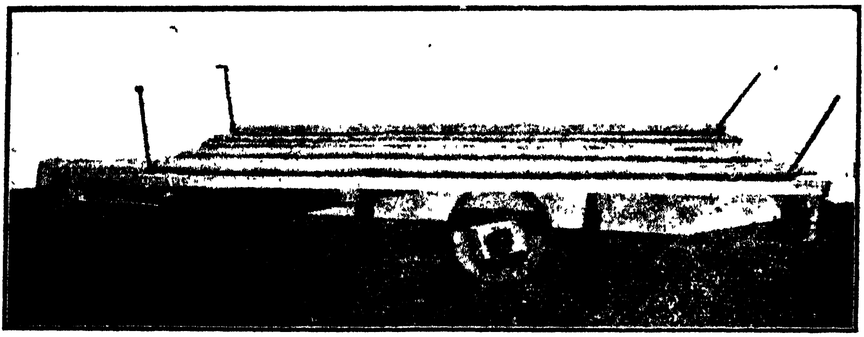
Think of that, ye North Coasters who have silos that stand empty year by year! It is the solution of one of your greatest difficulties, and it has the unanimous testimony of a whole community.

The platform of this trolley or carrier being low, the cut maize is thrown on to it with little lifting, the load being laid on fairly evenly with the cut ends all on one side. When the silo is reached, the load is drawn close up with the cut stems nearest the cutter so that one man pulls the stalks off the

load and feeds them straight to the knives with little if any effort and without any assistance. The unloading and the feeding to the cutter are thus accomplished by one man without either lifting or pitching.

There are slight differences of method, of course. We heard of one or two, for instance, who place a pair of ropes along the trolley platform and load the maize on top of them. When the load is aboard, the ropes are thrown backward over the whole and in the yard the load is pulled off by securing the ropes behind and drawing the trolley from under. Another farmer was found who draws in the load in the usual way, but instead of unloading direct to the cutter knives, he prefers to employ two men—one unloading on to a long narrow table, and the other feeding from the table to the cutter.

Such differences indicate the ways in which individual temperament influences the use of nearly everything, but in Mr. Bate was found a strong advocate of the method first described, and the fact that the great majority of farmers in the district adopt it is perhaps testimony to its economy and efficiency under most conditions



The Combined Trolley and Slide used for carrying in the green stuff at Tilba.
Every farmer has two or three of them.

The length of the haul from paddock to silo influences the size of the load, of course, the tendency being to make the load bigger where the haul is longer, but under any conditions the trolley reduces lifting and handling at either end to a minimum The usual practice seems to be to draw the load into the yard and right alongside the cutter, as already stated. The horses are then detached from the trolley and hitched to the empty one, which has been previously drawn out of the way by the men, and it is hauled off to the paddock for the next load.

How the Trolley is Made.

An illustration of this carrier—which in a way combines the idea of trolley and slide—accompanies this article, but a few details of its construction may be useful.

Two wheels of solid wood, from 20 to 24 inches high and 5 to 6 inches wide, tired with old tiring iron and running on a strong axle of 1½ inch iron, form the basis.

On the axle and fastened to it by iron clips, rest two pieces of 6 x 2 inch timber, so placed that they are 6 feet apart at the rear end and close together at the front, forming thus a broad V with the sharp end in front, and the axle about half way along the sides. These two heavy timbers, however, do not come quite together at the front. Working between them, on a strong swivel bolt, is a large iron-shod block of wood which rides on the ground as a sort of slide. To this front block are attached the chains by which the trolley is drawn.

Resting on the 6 x 2 bed pieces is the platform on which is loaded the fodder. This platform is usually about 12 feet long by 6 feet broad, and it generally consists of a framework of 3 x 2 timber covered with flooring or 3 x 1 battens. Four corner posts, of 3 x 2, are sometimes bolted, sometimes socketed into the frame to keep the material on the trolley while it is being moved. Sometimes these corner posts are simply four iron uprights, as in the illustration; sometimes they are missing altogether.

The trolley is so constructed that when it is loaded, it practically balances on the wheels, with not too much weight forward, so that as the horses move forward, the front of the swivel block is slightly lifted, though its middle and rear still travel on the ground. If the load is placed too far forward, the swivel block will not lift at all and may carry into ploughed or heavy ground.

Cut the Fodder Fine!

At the side of the silo, the material is cut into short lengths, generally by a chaff-cutter, and lifted by an elevator into the silo. There are a few farmers who consider that the silage-cutter is more efficient, but as the chaff-cutter is an essential to every farm, the great majority of men avoid the outlay involved in having two implements, and make the chaff-cutter serve both for silage and for chaff.

As to the length to which the material should be cut, there is little difference of opinion at Tilba. Experience has taught that if the packing in the silo is to be thorough and even, to the exclusion of loose pockets of poorly cured fodder, the pieces must be small—some farmers in other districts who have tried making silage economically would consider them too small, but solid packing is an essential to good silage, and cutting the material too long (1 and 2 inches in some cases) has been one rather common reason for failure. The Tilba men cut to half-inch lengths, and though most of the silos were empty when we saw them, the material that was lying about was ample evidence that the stuff is very thoroughly chopped up.

The types of silos favoured, the actual filling and packing, and the manner in which the labour of feeding the stuff to the cows is minimised, we must leave for next month.

(*To be continued.*)

Standardising New South Wales Dairy Products.

THE METHOD AND SYSTEM OF THE DAIRY BRANCH OF THE DEPARTMENT OF AGRICULTURE.

O. C. BALLHAUSEN, Assistant Dairy Expert, and J. MARROTT, Senior Clerk.

PRIOR to the passing of the Dairy Industry Act in 1915, no effective supervision of the manufacture of butter existed in New South Wales, and more than half the quantity manufactured was unfit for table use. Since the introduction of the Dairy Industry Act a great change has taken place, and now less than 10 per cent. of the butter manufactured is unfit for table use.

The question may be asked, "What has brought about this wonderful improvement?" The answer may well be summed up as follows:—

1. The strict supervision of raw material delivered from dairy farms to butter factories.
2. The control over butter manufacture by a highly efficient staff of instructors and inspectors employed by the Department of Agriculture.
3. The decentralisation of administration of the Dairy Industry Act and regulations.
4. The recognition by factory managers and dairy-farmers of the efficient instruction given by dairy instructors.
5. The strict supervision of the water supply, together with the equipment, construction, and situation of premises used for manufacture of butter, and the conditions under which the manufactured article is placed on the market for local sale.
6. The marketing of butter under brands denoting the grade quality.
7. As a result of the strict enforcement of Nos. 1, 2, 5, and (especially) 6, the general adoption of pasteurisation.

The average dairy-farmer does not realise the organised control that is exercised over his product from the time it leaves the farm until it is placed on the markets of Newcastle and Sydney, neither does he realise how the Government of the State of New South Wales has placed at his disposal the means for acquiring practical and scientific knowledge, so as to enable him to reach a state of prosperity.

For the purpose of decentralising instruction to dairy-farmers, New South Wales has been divided into eight dairying districts, and whenever possible the number of dairy produce factories in each district in charge of a Senior Dairy Instructor does not exceed twenty.

A further subdivision of districts will be made when additional instructional officers become available.

At the most convenient centre in each district a Senior Dairy Instructor is located, for the purpose of being in close touch with the dairy-farmers and butter factories in his charge. In the far north-east corner of New South Wales is situated the Tweed-Richmond district—only a very small area, but producing at least one-third of the total butter manufactured in the State. No less than nine officers of the Dairy Branch staff have been placed in this district for the purpose of giving instruction at dairy farms and butter factories, inspecting butter factories, and testing dairy herds for production.

Instruction to Dairy-farmers.

The dairy instructors engaged in giving instruction to dairy-farmers carry out their duties under a system which places them in touch with those who are really in need of their advice, *i.e.*, the farmer who receives grade returns from the factory classing his cream as inferior in quality. Now, these instructors are ex-factory managers and practical butter-makers or cheese-makers, with scientific training, which enables them to do a certain amount of laboratory investigation in chemistry and bacteriology. In the event of trouble they can obtain a fair indication of the cause from the flavour and appearance of the cream as received at the factory, and in addition they can make a rapid scientific examination by bacteriological plate and microscope. They are expert milk and cream graders, and therefore it is an easy matter for them to go on to a factory platform and pick out the cream, &c., which indicates that the owner is in need of assistance to improve the quality.

The instructor at once goes off to the farm, and on arrival commences a thorough investigation in detail of the methods employed by the farmer. No high-handed attitude is assumed, but just a harmonious heart-to-heart talk with the dairy-farmer, in which he explains his mission, understanding that no good can come of his visit unless he receives the farmer's co-operation. In this manner he achieves the remarkable success which has accompanied the instructional work on dairy-farms by officers of the Dairy Branch.

Typical Cases of Help Given.

As a typical instance of the success of this work the following facts are quoted:

Two farmers, A and B, supplied second-rate cream (inferior quality) to one of the largest butter factories in this State. The instructor reported to the manager of the factory, and to head office, Sydney, as follows:—

Farmer A.—Cream unclean flavour. Premises very fair; utensils good; strong smell from engine in dairy; mould growths in walls of dairy. SUGGESTIONS [not instructions] to farmer: Keep door from engine-room closed. Cut necessary hole in door for separator belt; put on door where directed; remove two boards at top and bottom of walls of dairy; put fine-mesh wire

or gauze on in place of boards for more ventilation. Remove mould in dairy, and lime-wash walls. General instruction in care of milk and cream.

Farmer B.—Cream unclean. Premises good; utensils fair. SUGGESTIONS: Pay more attention to washing up of utensils, especially separator parts. Get new strainer, and have milk vat retinned. Must not mix warm and cold cream together. Get stirrer, and stir cream frequently. Remove skim milk tub away from dairy after each separating. General instruction in care of milk and cream.

Six weeks later the Dairy Expert (the head of the Dairy Branch) wrote to the manager of the factory and asked what improvement had taken place in cream from Farmers A and B since the instructor's visit. The manager replied:—"I have to inform you that neither of the dairies mentioned has had second-class cream since the date mentioned."

These reports from instructors and the reply from the factory manager are samples taken at random from the records of the Dairy Branch, Sydney, of the many reports and replies received. The efficiency of the system is based on the fact that no time is wasted by the instructor in visiting farmers who are sending choicest quality cream to the factory, and that only those farmers who supply bad cream are given attention. Dairy-farmers should realise that it costs them absolutely nothing to get the advice which these capable officers of the Department can give, and that they should not hesitate to get in touch with them on all occasions when in trouble with the quality of their cream.

The Application of Science to Instruction and Inspection.

In addition to this practical instruction, the Department has, at the Biologist's Branch, a staff of trained bacteriologists, who are working in conjunction with the dairy instructors for the solution of the more difficult problems arising out of the various sources of infection which cause inferior quality cream. As an instance in this direction the following actual case may be quoted:—The manager of a certain factory reported to the district dairy instructor that cream received from Supplier X was consistently "ropy." The instructor visited the farm, and found everything done in a correct manner; straight away he realised that this was a case which would require more than ordinary investigation. He was given the assistance of an officer from the Biologist's Branch. Agar plates were exposed to the atmosphere of the bails during milking, and on them colonies of "ropy" bacteria developed. Large numbers of "ropy" bacteria were found in crevices of lids of cream cans, and in water which drained from washed separator parts. The cause of infection was traced to loose soil in the bails and yards where the cows were milked. Suggestions were made to the farmer "to remove the loose surface and lay the yards and bails with stones. The flanks and udders of the cows, before being milked, should be wiped with a damp cloth, so as to prevent dust falling into the milk buckets.

The greatest attention should be given to cleansing and disinfection of dairy premises and utensils, care being taken to remove any yellowish material collected in crevices of lids."

Eight months after the investigations and suggestions had been made the factory manager replied to an inquiry as to the quality of the cream now received from this supplier as follows:—"*Re* X's cream, we wish to say that his dairy has supplied choicest cream all this season, with the exception of one can four days old during Christmas week. Mr. X, together with ourselves, is gratified at the result obtained by your Department."

Managers and Farmers Co-operate.

A gratifying feature about the instruction to farmers in the care of milk and cream is the fact that the great majority of them co-operate readily with the instructor, and endeavour to carry out the advice given as far as possible. The butter factory managers are also most ready to assist the Department by reporting on results of instruction given. These reports are of considerable value, because they indicate an unbiassed opinion on an instructor's work. Reports received from instructors, and later replies from factory managers, are carefully perused at headquarters, and filed away in such a manner that they are ready at any time for reference purposes.

The Establishment of District Laboratories.

Dairy produce manufacturing companies have, at the request of the Department, taken steps to equip laboratories at many factories, so that dairy products, water, &c., can be examined on the spot by the Dairy Branch instructors. So beneficial have been the results obtained in this direct manner that other factories are rapidly falling into line. The scientific appliances provided by the farmers for these simple laboratories cost at least £100, but this sum is recouped them over and over again in the course of a single year by the prompt detection of causes of deterioration which otherwise would have resulted in great financial loss to both farmer and factory.

Carriage of Cream to Factory.

The complaint might be raised by a dairy-farmer that after going to the trouble of producing choicest cream he finds that the carrier taking the cream to the factory carries it exposed to the sun, and in such a condition that on arrival at the factory it is found to have deteriorated in quality. What protection is given against this state of affairs?

The regulations under the Dairy Industry Act provide that all cream carriers carrying cream for hire must provide protection from the direct rays of the sun to the satisfaction of an inspector, and all carriers for hire must submit their vehicles for inspection when called upon to do so. In the course of their work as instructors officers use the powers vested in them as inspectors under the Act, and dairy-farmers who have cause to complain about the vehicles in which their cream is transported should immediately report to their district dairy instructor. Quite recently four carriers were served with orders to place permanent covers on their

vehicles, so as to protect the cream carried from the direct rays of the sun. Inspectors are always on the watch in every district of the State to see that the farmers' cream is protected during transit to the factory, not only on the roads, but on river boats and railway.

Grading and Testing of Cream at the Butter Factory.

No employee is allowed to grade or test cream received from dairy-farmers at any butter or cheese factory in the State until he has attended one of the Dairy Science Schools held throughout the State each year, and has passed a practical and theoretical examination in cream testing and grading and milk testing. These schools are conducted by officers who have been recruited by the Department from the ranks of butter factory managers and head butter-makers, who have had, in addition to their practical experience in these positions, scientific training in bacteriology and chemistry, in conjunction with expert practical knowledge of grading and testing milk and cream. The examination in practical work at each school extends over a period of four days, and in theory over one day. The results of each student's grading are tabulated and compared with the standard grading of the examiners, and no student can gain a certificate unless he obtains the high percentage of 80 per cent. correct grading. The same applies to milk-testing examinations, so that, before any factory employee is legally entitled to grade and test cream, he must obtain a certificate under the Dairy Industry Act which indicates that he has passed the required examination to do the work. This certificate may be cancelled at any time if, for instance, an inspector finds during his visits to factories that the grader or tester's work is not up to standard, or that irregularities have taken place.

Dairy-farmer receives Payment in Full.

The previous paragraph shows the supervision exercised over factory employees testing and grading cream received from dairy-farmers. This supervision would not materially benefit the farmer if the Act did not provide that he must receive payment in full according to the quantity of butter estimated to be manufactured from the grade and test of his cream. If the butter actually manufactured exceeds the estimate of the cream tested, then the balance between the estimated quantity and that actually made and must be distributed amongst the dairy-farmers. If the quantity actually manufactured is less than that estimated, the payment made to the dairy-farmer on the estimated quantity must remain, and under no circumstances can any deductions in payments be allowed, because the Act throws the responsibility on the factory manager to manufacture the estimated quantity, so that the dairy-farmer is protected both ways. An inspector of accounts is continually engaged all the year round inspecting books of butter factories, to see that the dairy-farmer receives full payment for his products. Recently one of our large butter factories was ordered to distribute payment for over 3,000 lb. butter which had been wrongly deducted from suppliers through the factory not manfacturing the quantity of butter estimated from the cream tested.

The Instructor at the Dairy Produce Factories.

Perhaps the most important functions of dairy instructors and inspectors under the Dairy Industry Act are to exercise the strictest supervision over the manufacture of butter, cheese, &c., as a human food, and to assist the factory manager to produce a finished article, second to none in quality to that manufactured in any part of the world. To do this it is often necessary for the instructor to take off his coat and control the work of the factory in person.

Owing to the decentralisation of instructional work, factory managers can now get in touch with the Senior Dairy Instructor for their district, and get his assistance within a few hours. As previously explained, senior dairy instructors and dairy instructors are experienced butter factory managers, who have received a training in the higher scientific methods of butter manufacture. This scientific training in bacteriological and chemical laboratories enables them to investigate the cause of trouble which is beyond the province of the butter factory manager. The following is a typical instance of investigations and assistance rendered to a factory which was in trouble with the quality of its butter:—

A well-constructed brick factory, situated on the Tablelands, received choicest cream, which was effectively pasteurised by the holding system, but the resulting butter regularly deteriorated to second grade. Bacteriological plates exposed to the atmosphere inside the factory showed the premises were clean. Plates made of the pasteurised cream were clean; those made of the butter showed the presence in enormous quantities (over 150,000,000) of injurious organisms. Investigations showed the well water to be infected, and further investigations led to the discovery of the cause. The Senior Dairy Instructor then exercised his power as an inspector under the Dairy Industry Act by issuing remedial orders to the factory, which were effective in wiping out the cause of the trouble. Butter manufactured at this factory has since been marketed, after months of cold storage, as choicest quality.

Butter Grading.

The instructor is ever on the watch inspecting the raw material, factory water supply, premises and surroundings, factory plant, factory operations, and the subsequent transit of butter and conditions under which it is stored at cold stores. On arrival of large consignments of butter at Newcastle and Sydney selling floors, butter-graders inspect the butter to see that the quality is the same as that indicated by the brand on the boxes. This work is that of a specialist. It is a remarkable fact, but nevertheless true, that the experienced graders employed by the Dairy Branch can indicate by tasting an inferior quality butter in Sydney, and the probable cause of this inferior quality at some factory perhaps 200 or 300 miles away. The grader notes the characteristics of every box of butter examined, and records this on a grading form, which is sent direct to the manager of the factory concerned, and which conveys information as to the faults or general quality of the butter produced at the factory. Often the grader has detected a

cause of inferior quality which needs urgent attention at the factory. The factory manager is wired or 'phoned; and the Senior Dairy Instructor is as promptly instructed to proceed at once to the factory to investigate. In nine cases out of ten the deductions of the grader in Sydney have been found to be absolutely correct, and in all cases the Dairy Branch does not relinquish the effort until the fault is located and rectified.

Dairy Produce Factory Construction.

At the Dairy Branch headquarters a record is kept of every box of butter and consignment so graded, together with a record of the reports received from the Senior Dairy Instructors for each district on the structural condition of factory premises. This information is tabulated at the end of each export season, and is of immense value to the Department as an indication of the effect of structural conditions on the quality of butter, the work of butter-makers and cream graders at each factory, and the instructional work carried out by the staff of district instructors. The value of this system can be estimated from the following:—

If certain factories in an inspector's district are reported by him to be in an unsatisfactory condition, and the tabulated butter gradings show that the quality of the butter manufactured at these factories has been consistently graded down, then the Dairy Expert of the State immediately arranges an inspection of these factories, as a result of which, in many cases, inspector's orders are issued to provide a factory situated, constructed, and equipped up to the standard required under the Dairy Industry Act.

If the statement shows inferior quality butter being made at factories which have been reported by the inspector as possessing good equipment, premises, and water supply, then the fault clearly lies with the management or its staff, or transit conditions from factory to market, and an investigation by an instructor is at once made. The instructor is just as anxious as the factory manager to rectify faults, because if inferior dairy produce is received in larger quantities from factories in this district than from other districts, then, provided his factories are well constructed and equipped, a clear indication is given that instructional work in that district needs investigating from headquarters. It is thus seen that decentralisation has put a greater responsibility on the district officer.

In the near future it is hoped to obtain results which will wipe out even the low percentage of butter now found to be unfit for table use.

Travellers abroad during the last two or three years, who have tasted butter manufactured in Denmark, New Zealand, and other countries, have given, in every instance, emphatic statements that New South Wales choicest quality butter is the best in the world. New South Wales butter has won pride of place in competition with all Dominions of the British Empire. In America a consignment of butter received from New South Wales astonished American manufacturers on account of its high quality, and dairy college professors in that country have suggested that their students should finish their course with a visit to factories in this State, instead of going to Denmark, as in the past.

The Pasteurisation of Milk for Cheese Manufacture.

[Concluded from Vol. XXXIV, page 875]

T. H. ATKINSON, N.D.D., Senior Dairy Instructor.

IN order to prove or add to the information obtained at Hawkesbury Agricultural College from trials with small quantities of milk, further tests were made under practical conditions with larger quantities at the Moruya Co-operative Dairy Company's factory on the South Coast. The result with regard to yield was not exactly in accordance with our findings or the findings of others when working on smaller batches, although a final gain of 2 per cent. is shown. It might be pointed out, however, that such factors as the ordinary factory losses in leakage and waste of milk, spilt curd, adhesion and exposure of milk to larger surfaces in transit to the cheese vat, less care in washing and steaming plant, and a general exposure to greater atmospheric contamination have all been included, and have their influence in the final result.

This work was done in the winter, when the relative acidity of the milk was not high, and when it was possible on this account to eliminate the great advantage pasteurised milk would have over raw with a high lactic acid content giving a better pasteurised milk coagulum at rennetting. The same high acid content in the raw milk means an invariable loss in yield in the usual fast batch. This summer-time loss has not yet been gauged in pounds weight, but the experience of those who have gone through the hot summer months under both conditions points to a big saving in yield. The saving of energy to the cheesemaker is also considerable. Weather conditions at the time of recording these results were abnormal, and probably gave a greater contrast when considered from the point of view of flavour. The total supply of milk to the factory was much below normal, and the daily fluctuation most unusual. This was probably partly the cause of the great variation in yield on the different days. The conditions for raw and pasteurised milk batches on the same day would, however, be similar.

While the holding method of pasteurisation as adopted in the first portion of these trials is efficient bacteriologically and from the point of view of the quality of the cheese which can be produced therefrom, it has the great disadvantages of loss of time in the process and limited capacity. It is not practical where large quantities of milk are being handled. The method of pasteurising used in our commercial cheese factories, and which is practised at Moruya, is the "regenerative flash" method. There are many types of machines, all of which aim at a continuous flow and economy in heating and cooling by utilising the cold milk entering the machine to partially cool the outgoing hot milk. A regeneration of 35 deg. Fah. is usually obtained under average conditions. The speed of the pasteuriser and the rate of flow

ANALYSIS of Work done at Moruya Cheese Factory.

Date.	Total weight of Milk including starter.	Weights divided into— Raw.	Weights divided into— Pasteurised	Butter-fat.	Weight of cheese. Raw.	Weight of cheese. Pasteurised	Gain in favour of— Raw.	Gain in favour of— Pasteurised.	Moisture content. Raw.	Moisture content. Pasteurised.	Weight of milk per 1 lb. green cheese. Raw.	Weight of milk per 1 lb. green cheese. Pasteurised.	Remarks.
1922.	lb.	lb.	lb.	per cent.	lb.	lb.	lb.	lb.	per cent.	per cent.	lb.	lb.	
28 July ...	5,506	2,753	...	4·0	237	...	...	...	35·76	...	11·19	...	Pasteurised to 160 to 165 deg. Fah.
		...	2,753	4·0	...	258	...	21	...	37·58	...	10·67	
29 „ ...	4,846	2,423	...	4·0	249	...	...	...	35·39	...	9·73	...	„ „ „
		...	2,423	4·1	...	261	...	12	...	36·29	...	9·30	
30 „ ...	4,586	2,293	...	4·3	242	...	15	...	36·43	...	9·47	...	„ „
		...	2,293	4·0	...	227	...	...	...	35·53	...	10·01	
1 Aug. ...	5,041	5,041	...	4·2	550	...	...	...	33·76	...	9·15	...	Milk not divided. Made up without pasteurising.
2 „ ...	5,293	...	5,293	4·0	...	561	...	...	...	35·63	...	9·45	Total milk not divided. Pasteurised.
3 „ ...	4,866	2,433	...	4·0	275	...	...	...	38·76	...	8·81	...	Made to retain moisture. Pasteurised to 170 to 175 deg. Fah.
		...	2,433	4·0	...	291	...	16	...	43·25	...	8·36	
4 „ ...	4,730	2,365	...	4·1	247	...	...	...	36·66	...	9·57	...	Pasteurised to 160 to 165 deg. Fah
		...	2,365	4·1	...	239	8	...	...	35·41	...	9·89	
Total ...	...	...	...	...	1,250	1,276	23	49	...	...	...	...	

It will be seen that there is an increase of 26 lb. or 2 per cent. in yield in favour of pasteurised milk.

should be regular and maintained at the full capacity of the machine. Lessened flow means the subjection of the milk to the heat for a greater length of time, and at a temperature of 160 to 165 deg. Fah. produces a cheese after the type of one subjected to higher temperatures at the regular rate.

The Temperature to Pasteurise.

The degree of temperature to which the milk is heated naturally affects the quality of pasteurised cheese. It should be high enough to kill the majority of the undesirable micro-organisms, but yet not so high as to alter materially the chemical composition of the milk. The temperature of 160 to 165 deg. Fah. "flash" has been shown to be most desirable. It will be noticed from the results that temperatures higher than this were not desirable. Cheese made from milk treated at 170 deg. Fah. and over was characterless in flavour and lost considerably in body and texture. Lower temperatures are not effective. A wide variation in temperature during the process of pasteurisation is most undesirable on account of the varying effect it has on the composition of milk at various temperatures.

The table on page 199 shows our findings with regard to yield, and shows also the relation the yield bears to the moisture content.

On seven days (from 28th July to 4th August, 1922) the total milk received at the factory daily was divided so as to give as nearly as possible an even starting-point. This was attained by mixing the milk thoroughly in 1,000 lb. lots in a single vat on the scales, and then delivering 500 lb. to the cheese vat in the one case and to the milk holding vat prior to pasteurisation in the other. The milk was stirred during the period of delivery from the scales. The extra precaution was also taken to deliver first portions and second portions alternately to the different vats.

On the second and third days, in order to avoid delay on the receiving platform, a departure was made in the method of dividing by a division of suppliers only, keeping in mind the usual average butter-fat test of each supplier as a guide in order to arrive at a comparable quantity of milk in each vat. The difference in butter-fat test (Babcock) on the second day was 1 per cent., and on the third day ·3 per cent. in favour of raw milk. This method was considered unsatisfactory and was dropped, the one described above being adopted.

On 1st and 2nd August no division was made, the whole of the milk being treated, raw or pasteurised. A comparison of yields on these two days would not be fair, but the relative moisture contents to pounds of milk required to make 1 lb. of cheese in each case, show that influences other than the amount of moisture incorporated in the cheese affect the yield. It has been noticed repeatedly that a change of weather such as a cold snap may cause a decreased figure of as much as 50 gallons in a 1,000-gallon supply and not make any difference in the quantity of cheese made on the two days.

On 3rd August the pasteurising temperature was raised to 170 deg. Fah., with the result that great difficulty was experienced in expelling the moisture. A weak-bodied, quick-maturing cheese was made on that day as a control.

In analysing the yields of cheese over the period under review we find that the gains are reflected in the moisture contents of the finished cheese. The pasteurised lots show a greater amount of cheese to their credit on three days and the raw lots on two days. It appears that the manipulation during the process of manufacture is mainly responsible for the difference. Nevertheless the tendency is to retain more moisture in the pasteurised curd. Where the temperature at pasteurising is raised above 165 deg. Fah. it is very hard to get a curd of low moisture content. The higher the temperature the greater the tenacity of the curd to hold moisture, but the body and texture of the resulting cheese is also increasingly spoilt.

That pasteurised cheese treated under 165 deg. Fah. can be made to retain additional moisture during the summer without detriment to its other qualities is a great advantage. Cheese of high moisture content matures more quickly, other things being equal, and at present is in demand on our local market.

No reference has been made here to any increase in yield from extra retention of butter-fat in the curd. During these trials there was no appreciable difference in the loss of fat in the whey. That it can be obtained is shown by Sammis and Bruhn, of Wisconsin University, U.S.A., and by Mr. J. G. McMillan, when on the staff of the Dairy Branch of the Department of Agriculture of this State two years ago. The secret of this saving lies in the ability of rennet completely to coagulate milk. High temperatures cause a chemical change in the milk, which interferes with the normal functioning of rennet. This power can be restored by the addition of weak acids or soluble calcium salts. At present our factories are relying on the presence of sufficient lactic acid, either developed before pasteurisation or afterwards by means of a starter. In the summer, where the acidity of milk is fairly high, good results are obtained, but during the cooler season the result is a weak junket and a loss in butter-fat. It has been shown by Mr. McMillan that an increase in yield of 5·75 per cent. was obtained by pasteurising with the addition of hydrochloric acid. Of the increase 3 per cent. was attributed to HCl. It is our intention to demonstrate this advantage in one of the cheese factories in the near future.

Again an Improved Flavour.

As in the trials at Hawkesbury Agricultural College, the pasteurised cheeses at Moruya were superior in flavour to the controls made from similar milk unpasteurised. They were examined by Mr. A. T. R. Brown, Senior Dairy Instructor of the Department of Agriculture, and Mr. H. Parbery, Manager of the Moruya Co-operative Dairy Company. The cheese showed in all cases a marked improvement in flavour without losing in texture and body. In the case of the cheese made from milk pasteurised to 170 deg. Fah., the

flavour had not developed and the texture was loose and crumbly. The control cheese made on the same day was very weak-bodied, and lost considerably in flavour compared with the other controls.

Pasteurising is not the cause of good flavour in cheese, but only a preparatory operation in its production. There are many influences at work, all of which add their quota to the final result. Micro-organisms play the greatest part; both desirable and undesirable types grow freely in milk. Where milk is drawn and cared for under conditions of scrupulous cleanliness, there is no difficulty in producing good fine-flavoured cheese. Under our present conditions the quality of cheese milk leaves much to be desired, and almost invariably contains large numbers of undesirable types of organisms. It is the elimination of these which necessitates the use of the pasteuriser. By killing one type we also kill the other, making it necessary again to introduce the desirable types. This is done by means of a starter. It is on the quality of this starter, mainly, that a good flavour in the pasteurised cheese is obtained. Objectionable organisms can also be introduced, and very often are, by the use of filthy vats and utensils, thus minimising the effect of the pasteuriser.

The quality of the milk before it is pasteurised also has its influence. The greater the number of organisms in the milk before pasteurising the greater will be the number living and active after the process. It cannot be too trongly urged that at all times the greatest care should be taken of all milk. The cheese factory manager should rigorously grade the raw product prior to manufacture, discarding that which is in any way inferior.

Pasteurisation stands for uniformity of quality, and its commercial value is shown on the selling floor. It allows of the purchase and sale of produce on brand alone, for an even quality cheese creates its own market. The improved keeping quality of pasteurised cheese allows of prices being maintained in times of big supply and also allows of advantage being taken of periods of scarcity.

We are beginning to over-supply our local market, and are being forced nto competition with the rest of the world, and in order to get the best prices the highest possible quality only should be made and exported. This high standard can be attained by strict grading and the pasteurisation of all milk for cheesemaking.

A Pig-feeding Inquiry.

The case of a pig-farmer was quoted to the Department recently who had fed the animals on molasses, pollard and whey, and had been informed when they were trucked to the bacon factory, that they were of very poor quality and very yellow. Might an excess of pollard or whey have been responsible? Beet molasses had been known to give bacon an unsavoury flavour, but no ill-effects had been reported from the use of cane molasses.

It was stated by the Herdmaster of the Department in reply that none of the feeds mentioned should have made the flesh yellow. Probably the pigs had suffered from jaundice (*icterus*), due to the conditions under which they were kept, in conjunction with unsuitable dieting.

Summer and Second Quality Cream.

A. T. R. BROWN, Senior Dairy Instructor.

SUMMER brings with it the harvest, the dairy-farmer's harvest—cream. It brings also, however, sultry conditions, which often have an adverse effect on cream quality. The real test of the care and attention given to cream at the dairy in the hot, sultry summer weather takes place when it reaches the factory platform and is subjected to the critical examination of the grader. Some dairy-farmers may wonder why their cream is not tasted, but just put to one side. Many creams do not require tasting to be classed second grade—a glance at their physical condition is sufficient for the grader. If he were asked, he would probably inform the farmer that the cream was faulty, although the flavour was possibly quite satisfactory. It is to this class of cream that the following remarks apply.

A sound, choicest cream that has had proper care and attention at the dairy has an even consistency, and will run off the grading-rod in a smooth fashion, leaving no sign of curd or any other defect. On the other hand, a cream that is not looked after—that is, one which has suffered neglect as to cooling, mixing, and stirring at the dairy—will show signs of uneven consistency, and will often present what is known as "curdy" condition. If the grading-rod is inserted into this class of cream and lifted out, it will be found to be covered with a mass of small, white particles of curd. Such cream cannot be pasteurised satisfactorily, and so is classed second grade. This curdy condition is very noticeable in creams rich in milk sugar, for the thick curd is simply a coagulated casein brought to that condition by the presence of excess lactic acid and warm weather conditions. The lactic acid is formed in the first place by the conversion of the milk sugar into lactic acid by the lactic acid-producing organism. Naturally this curdy condition is more pronounced in creams deficient in butter-fat when subjected to warmth.

The standard for fat in cream delivered to butter factories from September to March must not be lower than 37 per cent., and this standard was determined upon for the summer months with the object (among others) of preventing curdling.

It has been found, however, that cream of 40 per cent. butter-fat content is about the most suitable cream for all purposes in the summer-time. The first thing a supplier who is troubled with curdy cream should do is to regulate his cream test by altering the "set" of the cream screw. In some cases cream testing up to 40 per cent. butter-fat has been found to be curdy, and this has been due to the mixing of the morning's warm, fresh cream with the previous evening's cold, acid cream. Cases of curdiness have been found in cream testing 40 per cent. fat, and where the night's and

morning's creams have not been mixed. In these cases, however—and it applies to about 90 per cent. of them—the cream has not been cooled over a water-pipe cooler.

It is hard to understand how dairy-farmers can hope to produce choicest cream in summer with temperatures ranging up to 100 degrees and over without some attempt at cooling. Coolers that will give satisfactory results are those that receive cold water from a large water-bag and operate when the separator is running. If the farmer has a well of good cold water all the better, but to use tank water is foolish, as its temperature is almost sure to be nearly blood heat unless cooled in a water-bag before use. The water-bag cooler is sound in principle and practice, and the difference between the prices obtained for a choicest quality and a second grade product soon makes up for the small expenditure entailed by the purchase of the cooler.

Where benzine tins are used as cream containers, care should be taken to fill the inside seams smoothly with solder, and so to render the tins practically seamless. Without this attention the seams act as a harbour for undesirable germ life, which may be the cause of curdiness in cream.

Soil Improvement Trials at Yanco.

In soil improvement experiments carried out at Yanco during the season, all plots treated with lime and gypsum showed a great improvement over the untreated land. On Mr. J. Gill's farm, the portion of land that had received a dressing of gypsum or lime and had also grown a green manure crop showed a marked improvement in its mechanical condition. After watering, when the land is being cultivated, the soil appears much more mellow and friable, and works up much better than the untreated portions or even those plots treated only with gypsum or lime. Mr. Gill states that when watering, the land in which the green crop was ploughed under takes a great deal longer to irrigate, although the same sized outlets are employed to allow the water on to the land; thus it must be evident that the soil has a great water-holding capacity. The same results may be said to have been obtained on Mr. Roberts' farm.—A. N. Shepherd, Senior Agricultural Instructor.

Kikuyu Grass and Chilian Clover at North Dorrigo.

On Mr. W. A. Parbery's property at North Dorrigo, kikuyu grass (*Pennisetum clandestinum*) planted a few months ago has made good headway, although the season was an extremely dry one. In January some of the plants were over a foot in diameter, and carried feed 6 inches in height.

The Chilian clover (*Trifolium pratense* var *perenne*) planted in 1921 was somewhat affected by frost in the early stages of growth, but proved a luxuriant grower during the periods when severe frosts were not experienced; this clover stood heavy grazing exceptionally well. During the recent dry season, its growth in the pasture paddock was somewhat checked, but with the December rains it is showing a succulent growth of 2 to 3 inches in height. It seeds well in an average season, the seed being of good quality and germinating readily.—J. N. Whittet, Agrostologist.

Methods of Immunisation Against Rinderpest.

H. R. SEDDON, D.V.Sc., Veterinary Pathologist.*

THE earliest attempts at immunisation against rinderpest appear to have been undertaken in the middle of the eighteenth century when, stimulated by the success of smallpox vaccination, various investigators essayed immunisation by means of the secretions of infected animals, but this was subsequently given up.

Later, the extensive outbreaks of rinderpest in South Africa led to a further study of immunisation against this disease, and, the cause of the disease then being known, more recent discoveries in bacteriology were applied. Of these one of the earliest in vogue was that (originally practised by Semmer, 1893, Nencki, Sieber, Wyznikiewicz) of injecting serum obtained from animals that had recovered from the disease. By the injection of such serum in large doses, immune bodies, present in the blood of the recovered animals, are transferred to susceptible animals in sufficient amount to protect them. Koch confirmed these results in 1897 and found further that when he added a small amount of virus to such serum, more satisfactory results were obtained.

The reason for this is as follows:—The serum contains immune bodies, which, when transferred to the body of a susceptible animal protect it so long as those immune bodies remain in the animal. Unfortunately, however, such bodies do not remain long in the body of such animals—not longer than two or three weeks—so that immunity produced by the injection of serum from a recovered animal is only transient, and thereafter the animal again becomes susceptible to the disease. Such an immunity, however, is immediate, *i.e.*, is present as soon as the injection is made

When virulent blood is injected, it of course produces an attack of the disease, but when that injection is accompanied by an injection of serum from a recovered animal, the immune bodies in that serum immunise the animal to a sufficient extent that the virus present in the virulent blood is able to induce only a comparatively mild attack of the disease. This mild attack, however, has been sufficient to induce a large production of immune bodies by the vaccinated animal, sufficient to have induced a lasting immunity in that animal.

* In forwarding this report for publication, Mr. Max Henry, M.R.C.V.S., Acting Chief Inspector of Stock, points out that in every civilised country in which rinderpest has occurred, the methods of control adopted have aimed at stamping out by slaughter, inoculation being used only as an adjunct when very large areas of country were involved. Serum inoculation is only valuable in dealing with current outbreaks, as immunity is so short, and other methods involve the risk of "breaks," *i.e.*, mortality following inoculation.

In many instances also there has occurred the transmission of other diseases, such as tick fever. The methods were, however, of great value in countries where eradication was for the time being impossible.

Prior to 1897 the Boers in South Africa had discovered the good results to be obtained by the injection of bile taken from an animal killed in the last stage of the disease. Koch thereupon transferred his attention to this method, as it seemed safer and more certain. So serious at this time was the disease in South Africa that other noted investigators (notably Turner and Kolle, Pitchford and Theiler, and Danysz and Bordet) were led to work there on the condition, and their results confirmed the value of serum to induce immunity.

Two French savants, Bordet and Danysz, however—and their method was followed by others—modified the "serum" method in two ways: (1) Increasing the potency of the blood of recovered animals by the subsequent injection of a large dose of virulent blood (hyperimmunisation), and (2) inducing an active (lasting) immunity in the animals to which such serum was injected by bringing them in contact with diseased animals, whereupon they contract a mild attack of the disease, this latter playing the same part as the injection of virulent blood used by Koch. They further believed that better results were to be obtained by the use of defibrinated blood than from the use of serum.

A further modification was evolved by Kolle and Turner, who considered that a deliberate infection by inoculation of virulent blood, made at the same time as the injection of serum, was preferable, as thereby one made certain that the animal would undergo a mild attack of the disease, instead of trusting to an infection from a natural case brought in contact. Koch, however investigated chiefly immunisation by means of the inoculation of bile and thoroughly studied its effects. He found that by such a method immunity was not conferred for eight to ten days, during which time animals could be naturally affected. Dr. Koch's opinion was that pure fresh bile contained the rinderpest organism in its natural and unmodified condition, but that its activity was restrained by the presence of immunising substances in the bile. Owing to the variable composition, in virus and immunising substances, of different samples of bile, sometimes the effect of the immune substances (similar to those present in serum), at other times the effect of the virus, would be produced. Thus one would get simply a transient (passive) immunity in the former case and a lasting (active) immunity in the latter, provided the virus was not present in an amount such as to cause a severe reaction and death of the animal from rinderpest. At other times the quantities of immunising substances and of virus would be so balanced that in this case a lasting immunity would be induced, the products inoculated acting in a similar manner to a serum and virus simultaneous injection.

Owing to this variability Edington introduced the method of inoculation by means of glycerinated bile. "It was claimed for such that it did not communicate the disease as pure fresh bile was liable to do, the glycerine having the effect of destroying the active organisms of rinderpest (as well as those of putrefaction), but that it exercised no modifying action on the immunising substances contained in the bile," the immunity, however, being only temporary (passive). This temporary immunity was likewise frequently converted into a lasting (active) immunity by the injection of virulent blood

into animals so treated. Another modification of the bile method was to pass it through a porcelain filter, this leading to removal of the virus of the disease and any putrefactive organisms that might be present. The filtrate so obtained would then have the same effect as glycerinated bile (or of serum). A further modification was the employment of a precipitate obtained after suitable treatment of the bile.

More recently a system of vaccination by the use of an attenuated virus has been employed, and at the present time such is being further studied with a view to its supplanting the methods now commonly in vogue in countries where rinderpest occurs.

The following summary gives the various methods that have been employed, with the exception of certain modifications, the omission of which is immaterial, for inducing a temporary immunity, *i.e.*, sufficient to carry an animal through an intercurrent outbreak. (The use of these is attended with marked curative effect should the animal be already infected.)

1. Serum from a recovered animal.
2. Serum (or defibrinated blood) from animals that have passed through an attack of the disease and have then been more strongly fortified by one or more injections of virulent blood, *i.e.*, hyperimmunised.
3. Bile—under certain circumstances.
4. Glycerinated bile.
5. Filtered bile.

Similarly the following are methods for inducing lasting immunity :—

1. Serum from recovered (or hyperimmunised) animal mixed with virulent blood.
2. Serum from recovered (or hyperimmunised) animal injected simultaneously with virus, but inoculated on different sides of the animal.
3. Injection of serum followed by exposure of the animals to natural infection.
4. Bile—under certain circumstances.
5. Bile followed by one or two injections of virulent blood.
6. Glycerinated bile followed by an injection of virulent blood.
7. Vaccine.

Of these, serum from a hyperimmunised animal and the serum-virus simultaneous method are the more extensively applied. Vaccine treatment is also undergoing the necessary extensive field trials with a view to its adoption instead of the serum-virus simultaneous method, as thereby there would be a very great saving of expense.

Failure of Tomatoes to Set Fruit.

Failure of tomatoes to set fruit is not uncommon, frequently occurring during the early flowering periods, when conditions are such as to produce most vigorous growth, as where the crop has been grown on land that has been over-manured or on good quality soil where the water supply is plentiful. Temperature also exerts its influence, and in a season such as the present, marked by fluctuations, this is no doubt partly the cause.

Where early crops of tomatoes are grown, steps are taken to guard against flowers not setting, and in addition to withholding water from the plants, some growers even go so far as to hand-pollenise the flowers, which operation is carried out during the heat of the day, when the condition of the pollen is likely to be most suitable for a satisfactory fertilisation.—A. J. Pinn, Special Agricultural Instructor.

Trade Conditions in the East.

THE reply of Mr. E. T. Sheaf, Australian Government Trade Commissioner in the East, to a Sydney firm which sought information in relation to the possibility of extending the eastern market for canned fruits, jams, fruit pulp, and dried fruits and milk, and to the trade customs in regard to credit, will doubtless be of interest to a number of *Gazette* readers. The firm intimated that business was to be strictly cash, and that it would be necessary for purchasers to establish an irrevocable letter of credit in some bank in Sydney.

"Much as I would like to see representative samples of Australian canned fruits, jams, &c., available for the information of Singapore," wrote the Commissioner, "I have to say that there would be very little chance of getting your brands taken up on irrevocable letter of credit terms against current American terms and established brands. American canned goods reach this market in fair quantity, the same being shipped to local firms who have been appointed as wholesale agents, generally on sight draft terms, or payment thirty days after sight. These agents have each, in the course of many years, built up a circle of regular dealers to whom they extend terms of from thirty to sixty days, and these dealers in turn have circles of retail kedais to whom they give similar credits. Quite recently, however, a travelling representative offered American canned goods, payment ninety days from date of shipment. In addition, there are actual American and Australian agents established in Singapore delivering from local stocks on thirty to sixty days terms, one Australian agent receiving goods on consignment.

"You will therefore see that it would be very difficult, if not impossible, to get in new brands on such rigid terms as you propose, especially when it is remembered that these markets are exceedingly conservative, will generally pay slightly higher prices for known brands, and that it is an unfortunate truth that Australia has not yet succeeded in establishing a reputation for packing, grading, and quality equal to America.

"As regards jams, much the same conditions apply as for canned fruits. Stocks of Australian jams are being held here and sold to the dealers and retailers on terms varying from thirty to sixty days, and I do not know of any importer who would consider your terms, especially for new brands.

"I am very sorry to have to write you such a pessimistic letter, but I would like to conclude by saying that if Australia will enter these markets with the same quality and maintain as regular a standard as American canneries, adopt their trading methods, and in the initial stages advertise, there is no reason why we should not get a fair proportion of the trade.

"If you could see your way to offer terms of from thirty to sixty days from sight of documents, and send me sufficient samples, not only for exhibition, but to offer for testing and examination, I should be pleased to bring your name before importers in Singapore and other parts of Malaya, and do my very best to secure reliable connections for you."

Orchard Experiments.

TRIALS WITH CONTROLS FOR APPLE MILDEW.

W. LE GAY BRERETON, Assistant Fruit Expert, and H. BROADFOOT, Orchardist, Glen Innes Experiment Farm.

A FULL report of the experiments in control of apple mildew was published in this *Gazette* of February, 1922, page 113, giving the results up to the 1920-21 tests. The experiments were continued, and the results of the two following seasons justify the conclusion that both atomised sulphur (an Australian production) and colloidal sulphur (the method of preparing which was published in the *Gazette* of November, 1922) are as effective as atomic sulphur as sprays for powdery mildew of apple. In the season 1922-23 a test was also made with hydrated lime-sulphur for the control of this disease, and it gave most promising results Tests are to be continued with this spray to ascertain whether after repeated trial it continues to give good control, for its preparation is simple and more in accord with orchard methods than colloidal sulphur It is also to be determined whether the quantity of sulphur and lime in hydrated lime-sulphur can be reduced.

The recommendations for control of powdery mildew of apple are as follows :—

1. Cut out and burn mildewed twigs as far as possible during winter pruning.
2. Spray with atomic or atomised sulphur (12 lb. to 100 gallons of water) or colloidal sulphur at the spur-bursting stage.
3. Spray with atomic or atomised sulphur (12 lb. to 100 gallons water) or colloidal sulphur combined with arsenate of lead at the times of application of the latter.

The comparative cost of 100 gallons of mixed spray of atomic sulphur, atomised sulphur, colloidal sulphur, and hydrated lime-sulphur are given below. In the case of colloidal sulphur and hydrated lime-sulphur cost of preparation is included. But it should be borne in mind that the cost of preparation is only claimed to be approximate, as work of this kind on the orchard is carried out in scraps of time and it is difficult to estimate the exact cost of work that is not carried out continuously over a fairly long period.

Atomic Sulphur.—The cost of 100 gallons atomic sulphur spray, using 12 lb. atomic sulphur at 9d. per lb. (purchased in 100 lb. parcel) to 100 gallons water, is 9s.

Atomised Sulphur.—The cost of 100 gallons atomised sulphur spray, using 12 lb. atomised sulphur at 9½d. per lb. (purchased in 100 lb. parcel), is 9s. 6d.

	s.	d.
Colloidal Sulphur.—		
10 gallons home-made concentrated lime-sulphur	3	6½
6 pints commercial sulphuric acid	1	5¾
Time	2	1¼
Cost of 250 gallons colloidal sulphur spray	7	1½
Cost of 100 gallons of spray	2	10
Hydrated Lime-sulphur —	s.	d.
20 lb. lime	0	8½
20 lb. sulphur	2	9¼
Time	0	10
Cost of 100 gallons of spray	4	3¾

The following quotations were used in calculating the cost of the last two sprays:—Lime at £2 per 10 cwt.; sulphur at £7 15s. per 10 cwt.; sulphuric acid at £6 per 10 cwt.; time, at 13s. 6d. per day of eight hours.

In comparing these costs it is worthy of note that colloidal sulphur can be made in "stock" quantities and kept (see departmental leaflet, "The Preparation of Colloidal Sulphur"). Hence, by the orchardist doing this himself in "off" times, the time taken in preparation need not interfere with the work of spraying or be an actual cash expense.

The Tobacco Harvest.

In the course of the next few weeks tobacco harvesting operations will be in full swing. Growers are advised to exercise the greatest care in picking the leaf or plants, as the case may be, at the right stage of ripeness. Most of the mistakes which have been observed in past years have been due to the fact that the barns have been filled with leaf at different stages of ripeness and have therefore produced an uneven cure. Do not attempt to cure tobacco that is not ripe, for it is inevitable that green-coloured leaf will be produced, and there is no colour which catches and distresses the buyer's eye so quickly. Most growers have the Department's pamphlet on tobacco production, in which are discussed the general principles and process of flue-curing.

Let the necessity of seeing that the leaf is properly yellowed in the barn before the temperatures are raised for the purpose of fixing the colour again be emphasised. Some growers also make the mistake of filling their barn too tightly. It should be obvious to them that the moisture produced by the heat given cannot be disposed of quickly enough through the ventilators, and the result is "sponging" or "splotching."

Briefly, the following are the points to be observed:—

1. Pick only ripe leaf or plants.
2. Do not pack or jam the leaf in the barn. Handle carefully so as not to bruise.
3. Yellow the tobacco properly before raising the heat above 110° Fah.

—C. J. Tregenna, Tobacco Expert.

Dairy Farm Buildings.

THEIR GENERAL OUTLAY AND CONSTRUCTION.

[Continued from page 124.]

L. T. MACINNES, Dairy Expert, and A BROOKS, Works Superintendent.

The Feed Stalls.

THE feed stalls (Fig. 20) are shown on the plan indicating the general layout (Fig. 1, January *Gazette*) as just at the rear of the bails, so that as the cows are milked they can go forward to be fed. Another system of feeding allows for it to be done during milking. When cows are fed and milked at the one time, care should be taken not to give dry feed, or dust will be created and will get into the milk. Should it be thought better to milk and feed under the one roof, it will be necessary to provide for a large number of cows to be brought in at the one time. For this a long shed, opening at the ends with provision for a row of cows on each side, is recommended. Each cow stands in position at an angle of 45 degrees, with its head through the bail gate to

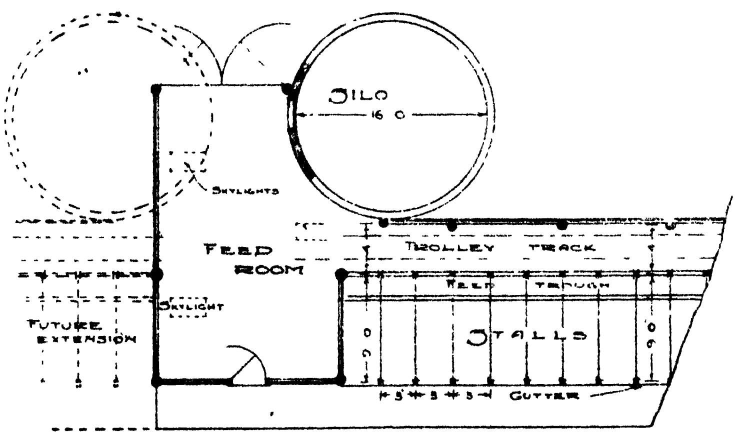


Fig 20.—Plan of Feed Stalls.

a manger. All the cows in one row are fastened at one operation by pulling on a lever, and the whole of the cows have to be milked and fed before any can be released. Under this system sixty cows can be milked and fed in, say, two lots, thus giving about an hour each for feeding purposes. A very good example of this type of milking shed and feeding stalls is installed on Mr. Allison's farm at Dungog, New South Wales

The plan shown in Fig. 20 is designed to suit those who feed their stock away from the milking shed. Provision is made for a feed room and one or two silos. The feeding stalls can be ranged on each side of the silos and feed room. If desired an additional row of stalls can be placed on the other side of the trolley line, which is laid down to carry the supplies of fodder along the

stalls. The mangers can be made of wood or reinforced concrete, bevelled to cut out all corners. The floors of the feed stalls, entrances, and exits are made of concrete or other suitable impervious material.

The Importance of Feeding.

The importance of conserving fodder, especially in such a cheap and safe form as silage, is receiving more attention each year. The conservation of fodder is a corollary to hand-feeding stock. Unless the farmer grows his own feed in a good season, he is heavily handicapped when the time of shortage comes round, as it does only too frequently. To have to go on the market to buy fodder in a time of drought in order to keep a starving herd alive is nothing less than ruinous. The price obtainable for butter will not warrant paying £10 to £15 a ton for lucerne hay or chaff for feed for milking cows.

There are really three essentials in the way of dairy buildings, namely, (1) the milking shed and bails, (2) the dairy, and (3) the silo and feeding stalls, and without the last the first two cannot be put to their best use.

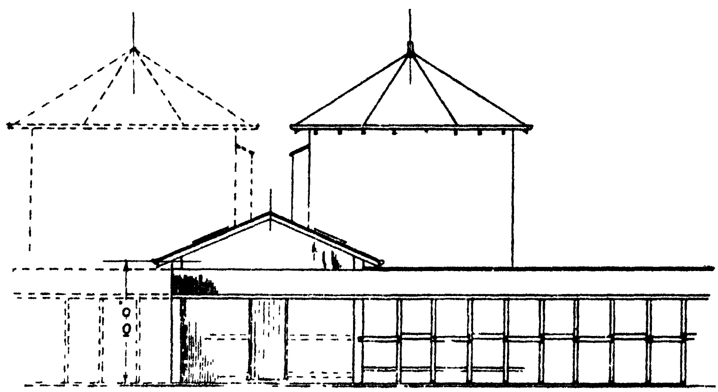


Fig. 21.—Side Elevation of Fig. 20.

In testing cattle for production it is necessary to feed them properly if any true idea is to be formed of their capacity to yield milk and butter-fat, and this fact is gradually becoming more generally recognised. In testing stud stock especially the value of hand feeding has been impressed on owners. Only by adopting a system of feeding balanced rations has it been possible to obtain so many records exceeding 1,000 lb. butter per annum. In view of this it is hoped that this plan of feeding stalls and silos will be much availed of.

Separate plans and specifications showing the construction of a silo in detail can be obtained on application to the Department. If necessary an officer will be sent to give instructions on, or to supervise, the work of erection. The Government Savings Bank is willing to assist in financing a farmer to provide himself with a silo, and when it is complete an officer of the Department of Agriculture will demonstrate to him free of cost how to fill it. These facts should indicate clearly how much importance the Department attaches to fodder conservation in this form and the better feeding of dairy herds.

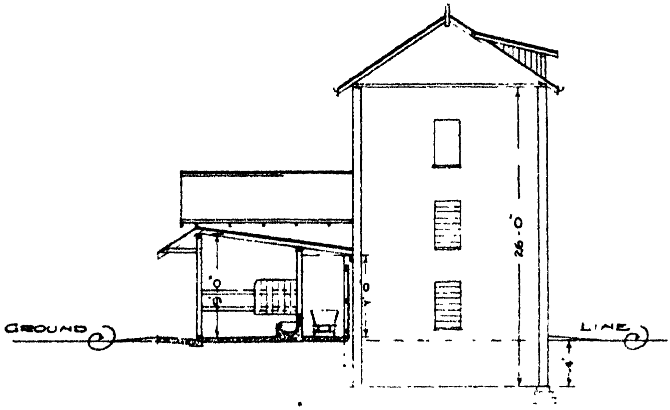
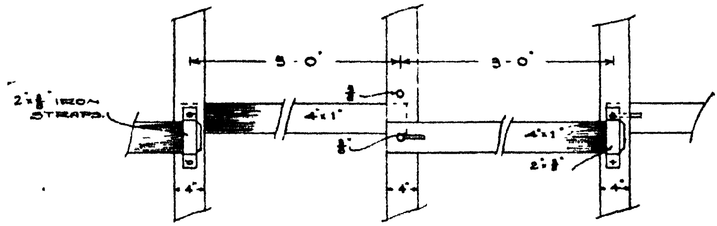
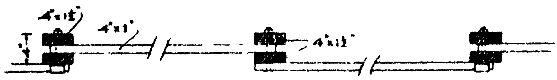


Fig 22 —Section through the silo of Fig. 20.



A



B.

Fig. 23.—Details of Pivoted Rails at Heel Posts.

A—Elevation:. B—Plan.

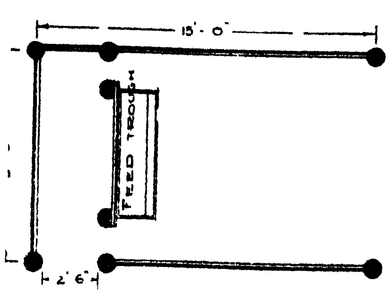


Fig. 24.—Plan of Bull Shed.

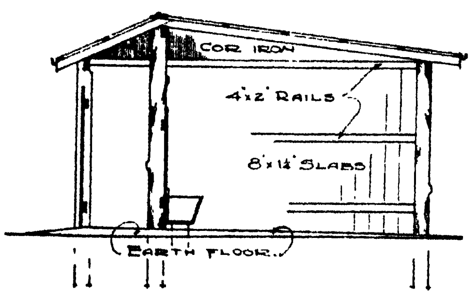


Fig. 25.—Section of Fig. 24.

The Bull Shed.

This is a simple structure, but the erection of it and the provision of a separate bull paddock, involve a principle of great importance. Far too many dairymen allow the bull to run at large with the herd. The practice is dangerous from the point of view of disease, it is wasteful from a breeding point of view, it prevents records of services being made, and altogether it means lack of system and inefficiency. Many dairy-farmers, unfortunately, are not in a position to buy a good pure-bred bull of authentic production strain. Others, again, in their ignorance imagine that it suffices to buy something with a pedigree, plus, if possible, the distinction of a show exhibit ticket. And some there are who are content to let any mongrel be at the head of their

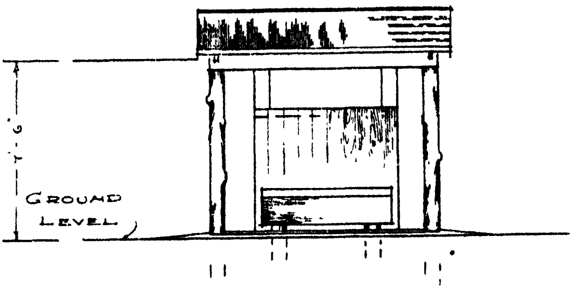


Fig 26.—End Elevation of Fig. 24.

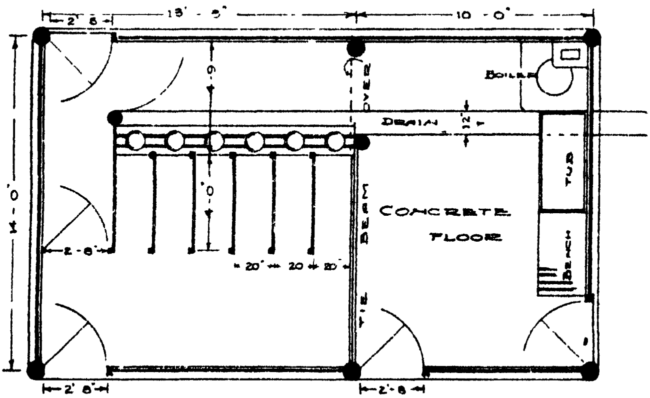


Fig. 27.—Plan of Calf Pens.

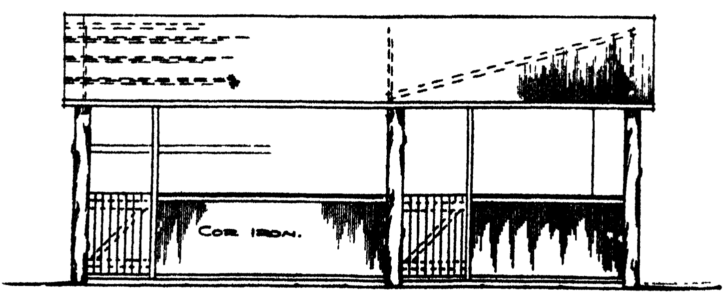


Fig. 28.—Elevation of Fig. 27

dairy herd, as long as the cows periodically freshen and come into the milking yard—they have no idea of herd improvement, and they do not bother to figure out that the average butter yield of their cows may be but 100 lb. per year. Yet there are some, and the number is fortunately increasing, who

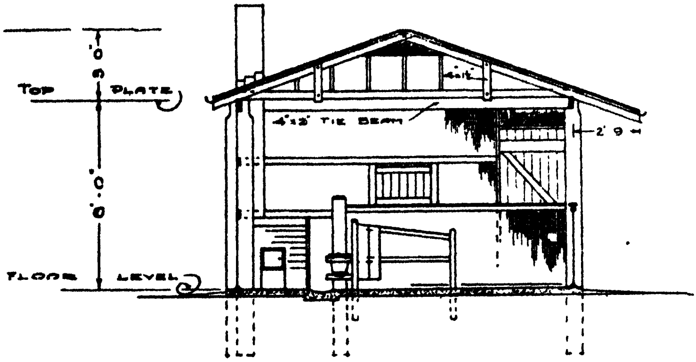


Fig. 29.—Cross Section of Fig. 27.

know the value of a good bull, and, having got one, the importance of looking after him properly. It is to such that this plan of a bull shed may appeal and be of service. By referring back to Fig. 1, it will be seen where it is recommended to place this shed, namely, near to the fodder and water supplies, open to the north so as to get the sunshine, and closed to the south and west to ensure better shelter from the cold winds and rains.

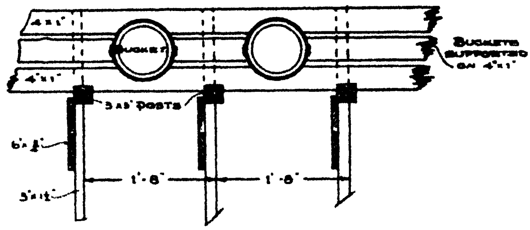


Fig. 30.—Plan showing details of Calf Pens.

The Calf Pens.

Where calves are kept, and especially where the farmer is systematically building up a good herd, it is important that proper provision be made for housing and feeding the youngsters. It is improvident to get a promising young heifer from a top-notch cow, and, for want of care and attention, to let it either become stunted or die at an early age. The plan shown in Fig. 27 is designed with two prime aims—(1) to facilitate the feeding of the animals, and (2) to facilitate the task of keeping the premises clean. Clean, wholesome feeding, and clean sanitary housing keep disease away. Where there is

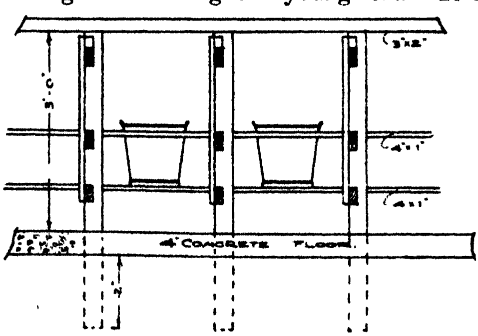


Fig. 31.—Section of Fig. 30

cleanliness and sunlight, there should be no white scours or other troubles from disease-breeding organisms.

The plan is self-explanatory. The method of holding the feeding buckets to prevent upsetting is simple and inexpensive. Provision is made for heating water for washing utensils. This may not be thought necessary where a small

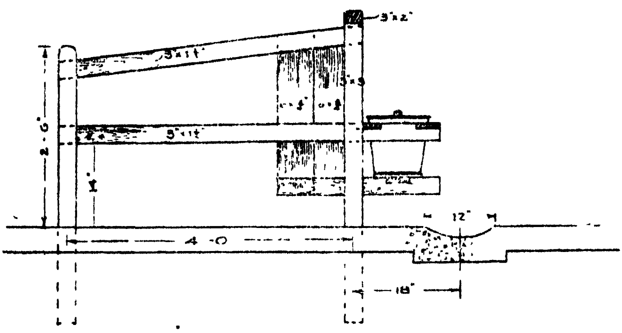


Fig. 32 —Side Elevation of Fig 30

lot of calves are reared, as it would be no great trouble to carry the buckets to the general wash-up place at the dairy or milking shed. Separate accommodation was provided in Fig. 1 for sick calves to enable them to be isolated and thus to prevent disease from spreading—a most important precaution.

(*To be concluded.*)

The Economic Value of Stoats, Weasels, and Ferrets.

In view of the remarks made from time to time as to the value of stoats, weasels, and ferrets as rabbit exterminators, and the suggestion that they should be imported for that purpose, some recent observations by one who has had first-hand experience of these animals in another country is of interest.

Mr. Charles Gilliatt, an English farmer who has been in New South Wales about two years, states that the ferret, weasel, and stoat are much alike, and all prefer birds to rabbits as food. Especially are they fond of young ducks and chickens, and their appetite for winged creatures is so keen that they even capture the elusive partridge.

Their method of destroying rabbits is to suck their blood. As to their efficacy in control, Mr. Gilliatt instances a paddock of 12 acres which was overrun with rabbits. With ferrets and gun some eighty pairs were accounted for the first day, and forty pairs the second. The ferrets, together with some odd weasels, were then left in the paddock to breed, but they did not succeed in cleaning out all the rabbits.

About twelve miles from his English home, this farmer added, there were seven to eight miles of country overrun with rabbits, weasels, stoats, and foxes, which had all been running together in this wild state for years. He is definitely of the opinion that stoats and weasels unaided will not exterminate rabbits, and considers them more destructive than the rabbits.—Mark H. Reynolds, Senior Agricultural Instructor.

Orchard Notes.

MARCH.

W. J. ALLEN and W. LE GAY BRERETON.

Harvesting.

MARCH to April is generally a busy time for the apple and pear grower of the tableland and later districts, for the bulk of the main varieties are ready for picking during this period.

The apple crop, taken generally, is light this season, and up to the present prices have been very satisfactory. For these reasons it is not expected that export from this State will be heavy, but we would again urge that where shipments are made the greatest care be taken in grading and packing, so that the good reputation of our fruit may be maintained, and in future seasons, when large shipments are made oversea, buyers will not be shy of it.

Pears should only be exported in single-tier trays.

Guides for picking and marketing have been given in these notes in previous seasons, and are also obtainable in leaflet form. Further brief references to the subject were made last month.

Pests.

During the busy time of marketing one is tempted to neglect the regular collection and proper destruction of infected fruit. This, however, is a very short-sighted policy and one that will prove costly later on; moreover, it is most unfair to fellow growers in the district who faithfully carry out the work of destruction. The dangers of fresh infection from returned or second-hand cases should not be overlooked, and where these are used proper precautions should be taken, otherwise the measures previously taken for the suppression of pests may be practically nullified.

The rains since the new year have put citrus trees in a condition in which scale pests can be dealt with. It is not too late to fumigate for scale (red, brown olive, white, and pink wax) and louse on citrus trees. Indeed, one of the great advantages fumigation has over sprays for the control of citrus scale is that it may be delayed till practically all the eggs have hatched, whereas if sprays are similarly delayed they often fail to kill those insects that have hatched from the earlier eggs and that have had time to develop their protective coating; on the other hand, when sprayed early many eggs hatch out after the spray has been applied. The disadvantage of fumigating too late is that, though the red scale is killed, it sometimes fails to crack off the fruit by picking time.

Green Manure Crops.

In the milder climates, if good autumn rains have set in, the sowing of peas for green manure can be continued during the early part of this month, though it is better to get them in earlier, as directed in these notes last

month. Such crops should be sown in conjunction with a mixture of superphosphate and bonedust, or superphosphate and blood and bone, half and half by weight.

There are certain warnings which cannot be repeated too often in reference to the practice of green manuring for the orchard. In the first place, it should only be attempted in districts where the rainfall is ample, or where water for irrigation is available. Secondly, should very dry weather set in during the autumn and there be danger of the trees suffering from the green crop robbing them of moisture, do not hesitate to plough at once; it is too risky to wait in the hope of rain. Thirdly, in any case have the green crop all turned under by the middle of July, even if it has not reached full growth when ploughing is commenced. If left later and the latter part of winter and spring are dry, not only will ploughing be difficult and the green crop perhaps fail to rot, but the trees will suffer from lack of moisture.

In districts where the normal rainfall is only just sufficient, and irrigation is not practised, the orchard should be ploughed as soon as possible after the fruit is removed from the trees, in order to give the land as much opportunity as possible of absorbing any rain that falls in autumn and winter.

Planting Time.

In the milder districts, it is not too late to plant out citrus trees towards the end of this month, provided the ground has been well prepared before and is in nice moist condition. Trees planted in the autumn should be protected by a few bushes put in around them before the winter sets in.

Where it is intended to put out additional areas of deciduous trees, the land should be ploughed and subsoiled as early as possible. It can then be left in a rough condition, and will have every opportunity of absorbing any rain that falls before planting.

Any roots that are torn out or found by the subsoiler should be burnt off. The orchard burner is a very useful contrivance for this work. One great advantage of using the subsoiler in preparing land for fruit trees in country liable to armillaria is that it very thoroughly discloses roots and stumps that have been missed and that can then be grubbed and burnt, and thus reduce a very common source of infection.

To Dry Peaches

FIRM yellow-fleshed varieties of freestone peaches, such as Elberta, are the best for drying. The fruit must be "soft ripe" for the purpose, but in such a condition that it will cut with a sharp knife without going mushy. Cut clean round the suture and remove the stone and place the fruit cup upwards on trays. Fumigate with sulphur fumes, using about 1 lb. sulphur to 200 cubic feet, until the juice sweats out from the cut surface—the juice will not fill the cup as it does in the case of the apricot. The trays should then be placed in the evaporator or (if the climate is sufficiently dry) in the sun, until the inside of the fruit is cured to a pliable, meaty condition.

The process is fully described in "Fruit-drying," Farmers' Bulletin, No. 52, obtainable (price 10d post free) from the Government Printer, Sydney.—W. LE GAY BRERETON, Assistant Fruit Expert.

The Stock Diseases Act, 1923.

MAX HENRY, M.R.C.V.S., B.V. Sc., Chief Veterinary Surgeon.

TOWARDS the latter end of 1923 an important piece of legislation closely affecting primary industries was placed on the statute-book of this State. The Act referred to is entitled the Stock Diseases Act of 1923. The passage of this act repeals the Stock Diseases (Tick) Act, 1901, and the Stock Diseases (Tick) Amendment Act, 1915, but until definitely repealed all regulations in force under these two acts remain in force unless definitely over-ridden by the provisions of the Stock Diseases Act, 1923. All persons appointed under the old acts and holding office at the commencement of this act are deemed to have been appointed under the provisions of the new act.

The methods of the old acts have to a great extent been maintained, but the scope of the act has been widened and many difficulties which the old acts placed in the way of effective control of disease have been remedied.

The use of the word " stock " in the act has been enlarged so as to cover not only any animals which may be proclaimed, but also birds. This alteration was effected because there was not under any legislation existent in this State power to deal with the diseases of poultry, and it was felt necessary that, if at any time the important and flourishing industry of poultry farming was threatened by disease, the State should be enabled to take protective action as is done with livestock of other kinds.

Power is given to the Governor to proclaim any disease to be a disease in respect of which all or any of the provisions of the act shall apply. The list so far proclaimed is as follows :—

Anthrax.
Blackleg.
Cattle Tick (*Boophilus australis*), Infestation with.
Contagious Pneumonia of Swine.
Epizootic lymphangitis.
Foot and Mouth Disease.
Glanders.
Johne's Disease.
Necrotic Enteritis of Pigs.
Pleuro-pneumonia contagiosa.
Piroplasmosis, including Tick Fever.
Rabies.
Rinderpest.
Scabies (Scab, Mange).
Sheep Louse (*Trichodectes sphærocephalus*) and Sheep Tick (*Melophagus ovinus*), Infestation with.
Swine Erysipelas.
Swine Fever.
Trichinosis.
Trypanosomiasis.
Actinomycosis.
Cancer.
Tuberculosis.
Contagious Abortion.

This list differs considerably from that proclaimed under the old act and is drawn up in accordance with the decision of the last conference of Chief Veterinary Officers to arrive, if possible, at uniformity and a list of diseases scheduled under the acts of various States.

riculture.

Of these the following were proclaimed under the Stock Diseases (Tick) Act, and the reasons for their inclusion are obvious to anyone acquainted with the disease conditions existent in New South Wales:

Anthrax.
Blackleg.
Cattle Tick infestation.
Contagious pneumonia of Swine.
Pleuro-pneumonia contagiosa.
Piroplasmosis, including Tick Fever.
Sheep Louse and Sheep Tick Infestation.
Swine Fever.
Actinomycosis.
Cancer.
Tuberculosis.

Of the others, Johne's disease has been included because it is considered that there is some risk of the disease being introduced from England, and one case at least has been recorded in this country. Necrotic enteritis of pigs, which was often in the past confused with swine fever, is known to exist and it might at any time be necessary to act to prevent its spread. Rinderpest has occurred in Western Australia and has to be guarded against, and trypanosomiasis in the form of surra has also occurred in Western Australia. Epizootic lymphangitis, foot and mouth disease, glanders, rabies, swine erysipelas, and trichinosis do not exist in the country, but are the diseases perhaps most likely to be introduced in oversea stock.

The position as regards scab in sheep (scabies) was peculiar, since under the old act it was specially exempted from the provisions of the act and a very large portion of the Pastures Protection Act was devoted to the disease. Now that the exemption has been deleted, much of the Pastures Protection Act can be repealed and uniformity of control brought about. The omission of the five words "not being scab in sheep" has thus brought about a very useful consolidation. The present definition of the disease will also cover mange in any animal.

As regards contagious abortion, it was not desired to take action except as regards the prevention of the use of living abortion vaccine.

Provision is made in the act for the appointment of a Board of Tick Control, with a Government officer as Chairman, to deal with the eradication of the cattle tick in the tick quarantine areas.

The powers of inspectors appointed under the act are very similar to those in the old acts, and include powers of entry, inspection, treatment, seizure, and detention of stock and in addition inspectors are given power to quarantine—a new feature the lack of which often caused difficulty before. The Minister has power to declare quarantine areas, and has also power to accept an undertaking from an owner to comply with quarantine requirements, in which case no public quarantine would be declared.

Extra provision is made to enable fencing to be enforced in quarantined areas when it is considered necessary.

Power to order destruction of live stock and things is vested in the Minister, but a proviso has been included enabling the Governor to authorise an inspector to exerc[illegible] which the Minister might exercise within a quarantine

Penalties are provided in the act for abandoning infected stock or stock within a quarantine area, or allowing them to stray, leaving carcases of infected stock within half a mile of a road, selling or offering for sale diseased stock, communicating disease except under prescribed conditions, breaking down and damaging fences used to control stock or transporting, driving or moving infected stock on a railway, road or public place.

Power is given to issue regulations governing all phases of the control of infectious disease.

COLOUR AND STAMINA IN BEES.

THE attractiveness of the Italian bee was remarked over two thousand years ago, when both Aristotle and Virgil wrote of its beauty and commended it for its working qualities in comparison with other strains. The Italian bee, and especially the brighter strains, still appeals to the bee-farmer, but we have improved on its appearance of late and have succeeded in producing from the original three-banded bee a four and even five-banded (golden) type. By judicious selection we have produced, moreover, a bee which combines with this beautiful colouring a capacity to give very good results in apiary work.

If this bright-coloured stock tests out well in relation to the work of honey-gathering, wintering, &c., and proves to have stamina, it will be quite satisfactory to breed from; but the beginner—and at times the older hand—is often tempted to breed from the most beautiful bee in the yard without first having tested it fully, only to discover later that vitality has been sacrificed for colour.

The introduction of colour among black and hybrid bees by the use of breeding stock of selected golden Italian strain often gives very good results, for there is always a tendency for the progeny of the young queens to show a reduction in colour, and there is less loss of vitality in the process of reduction from five bands to three than in increase from three bands to five.—W. A. GOODACRE, Senior Apicultural Instructor.

DOES HERD-TESTING JUSTIFY ITS COST.

THE question is sometimes asked—does the information gained or the advantages arising from herd-testing justify the cost? This question can perhaps best be answered by asking another. If herd-testing associations are of doubtful value, why is it that at the end of 1920, in Denmark, Norway, and Sweden, over 1,200 such associations were in existence, in Canada and the United States of America over 500, in Germany some 330, and in Great Britain some 70 or 80?

Recent figures credit Wisconsin, United States of America, with over 140 active associations. In thirteen years the average production of butter-fat from approximately 1,300,000 cows in that State has been raised from 150 lb. to 185 lb. During the same time the average of the Herd Test Association cows has been raised to 6,500 lb. of milk and 260 lb. of butter-fat.—W. J. YUILL, in the Victorian *Journal of Agriculture*.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1923:—

Description.	Country of Origin.	Imports.	Exports.
Interstate—			
Fresh Fruit ... ... cases	....	379,522*	122,845†
Pineapples ... ... centals	....	....	6
Melons ... ... doz.	....	....	....
Canned Fruit ... ... lb.	....	26,740	364
Dried Fruit—			
Unspecified ... ... ,,	....	29,624	616
Currants ... ... ,,	....	9,688	....
Raisins ... ... ,,	....	15,820	....
Apricots ... ... ,,	....	6,972	....
Apples ... ... ,,	....	8,288	....
Prunes ... ... ,,	....	9,716	476
Pears ... ... ,,	....	1,624	....
Sultanas ... ... ,,	....	7,254	....
Peaches ... ... ,,	....	1,512	392
Oversea—			
Fresh Fruit—			
Citrus ... ... cental	....	26	4,003
Apples ... ... ,,	....	....	441
Pears ... ... ,,	....	....	778
Pineapples ... ... ,,	....	....	451
Bananas ... ... ,,	....	9	7,939
Other ... ... ,,	....	....	1,927
Dried Fruit—			
Apples, pears, peaches, &c. lb.	U.S.A.	5,670	....
Apples ... ... ,,	....	....	1,234
Apricots ... ... ,,	....	....	990
Currants ... ... ,,	....	....	47,357
Prunes ... ... ,,	France	10,894	....
Do ... ... ,,	U.S.A.	226,849	2,958
Peaches ... ... ,,	....	....	1,590
Raisins—Sultanas ... ... ,,	Commonwealth ...	12,880	3,961
	Turkey	75,546	....
Lexias ... ... ,,	....	....	168
Other ... ... ,,	Spain	25,223	....
	U.S.A.	2,500	1,780
Dates ... ... ,,	Mesopotamia ...	3,343,742	10,296
Other ... ... ,,	United Kingdom ...	4,469	2,189
	China...	17,107	....
	U.S.A.	52,711	....
	France	48	....
	Spain	10,125	....
	Turkey	85,082	....
	Greece	5,000	....

* Imports *via* Wahgunyah for November not available.
† Exports to Western Australia for December not available.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat:—

Canberra	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bomen.
	J. Haggart, Warre Warral.
	T. R. Jones, Birdwood, Marsden Road, Forbes.
	W. W. Watson, Woodbine, Tichborne.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	J. W. Eade, Eade Vale, Euchareena.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
	Mailer Bros., Trundle Park, Trundle.
	H. M. Hall and Sons, Studbrook, Cunningar.
	H. K. Nock, Nelungaloo.
	Hobson Bros., Glenlea, Cunningar.
	R. J. O. Berryman, The Wilgas, Trundle.
Clarendon	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Temora.
	J. W. Eade, Eade Vale, Euchareena.
	Mrs. J. D. Berney, Kildara, Cumnock.
Cleveland	Manager, Experiment Farm, Bathurst.
	J. W. Eade, Eade Vale, Euchareena.
	W. Burns, Goongirwarrie, Carcoar.
College Purple	Hobson Bros., Glenlea, Cunningar.
Currawa	Manager, Experiment Farm, Temora.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
	J. W. Eade, Eade Vale, Euchareena.
	H. K. Nock, Nelungaloo.
Federation	Manager, Experiment Farm, Temora.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	P. Corcoran, Weeroona, Moombooldool.
	Mailer Bros., Trundle Park, Trundle.
	H. M. Hall and Sons, Studbrook, Cunningar.
	Hobson Bros., Glenlea, Cunningar.
Firbank	J. W. Eade, Eade Vale, Euchareena.
	H. M. Hall and Sons, Studbrook, Cunningar.
Florence	T. R. Jones, Birdwood, Marsden Road, Forbes.
	Mrs. J. D. Berney, Kildara, Cumnock.
Genoa	Manager, Experiment Farm, Glen Innes.
Gresley	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Temora.
	E. J. Allen, Gregra.
	W. W. Watson, Woodbine, Tichborne.
	J. W. Eade, Eade Vale, Euchareena.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	T. R. Jones, Birdwood, Marsden Road, Forbes.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
	Mailer Bros., Trundle Park, Trundle.
Hamel	Mailer Bros., Trundle Park, Trundle.
	Hobson Bros., Glenlea, Cunningar.

***Wheat*—continued.**

Hard Federation	Manager, Experiment Farm, Temora. J. W. Eade, Eade Vale, Euchareena. E. J. Allen, Gregra Mrs. J. D. Berney, Kildara, Cumnock. W. W. Watson, Woodbine, Tichborne. J. Parslow, Kelvin Grove, Collie Road, Gilgandra. P. Corcoran, Weeroona, Moombooldool. Mailer Bros., Trundle Park, Trundle. H. M. Hall and Sons, Studbrook, Cunningar. H. K. Nock, Nelungaloo. Hobson Bros., Glenlea, Cunningar.
Improved Steinwedel	W. W. Watson, Woodbine, Tichborne. E J. Allen, Gregra.
Marshall's No. 3	Manager, Experiment Farm, Bathurst. Harvey Bros., Enterprise, Dubbo. Hobson Bros., Glenlea, Cunningar. E. J. Allen, Gregra.
Onas	H. K Nock, Nelungaloo.
Penny	W. W. Watson, Woodbine, Tichborne. Hobson Bros., Glenlea, Cunningar.
Waratah...	Manager, Experiment Farm, Temora. J. Haggart, Warre Warral. T. J. A. Fitzpatrick, Erin Vale, Warre Warral. H. M. Hall and Sons, Studbrook, Cunningar. Hobson Bros., Glenlea, Cunningar.
Yandilla King	Manager, Experiment Farm, Temora. T. J. A. Fitzpatrick, Erin Vale, Warre Warral. P. Corcoran, Weeroona, Moombooldool. Mailer Bros., Trundle Park, Trundle. H. M. Hall and Sons, Studbrook, Cunningar. Hobson Bros., Glenlea, Cunningar.
***Oats*:—**	
Algerian...	Manager, Experiment Farm, Bathurst. Manager, Experiment Farm, Temora. E. J. Allen, Gregra.
Guyra	Manager, Experiment Farm, Temora.
Lachlan	E. J. Allen, Grega.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

ORANGES ON SEVILLE STOCK.

"WILL you please inform me whether a Valencia orange—or for that matter any other orange—worked on to a Seville will have imparted to it the bitterness of the Seville when it (the scion) comes to fruition? Also whether a Valencia worked generation after generation on to a common lemon will eventually acquire any of the characteristics of the lemon stock?"

In reply to the foregoing it was stated that the working of an orange on to a Seville would have little if any effect upon the flavour of the fruit.

Whether a Valencia Late orange worked generation after generation on to a common lemon would eventually acquire any of the characteristics of the lemon stock is rather hard to determine. It has been claimed by some that it would, but the Department is not in a position to express a definite opinion on the subject. Valencia has been worked for some time on lemon stock in Australia, and where proper care has been exercised in selecting buds from trees carrying good crops of high quality fruit there has been no reason for complaint as to quality or flavour.—W. J. ALLEN.

Poultry Notes.

MARCH.

JAMES HADLINGTON, Poultry Expert.

THE most important work on the poultry farm at this time of the year is the marketing of the balance of the aged hens that are to go out, getting the pullets into their adult quarters, and preparing for the breeding season.

Culling was dealt with fully in these notes in February of last year, and readers will no doubt have refreshed their minds in respect of this seasonable work. As was pointed out at that time, if the young stock is of good breeding and it has been well reared there should not be more than 5 to 8 per cent. of pullets to cull out. In this connection, one sees many flocks where 30 per cent. culling would scarcely make a good job of the remaining flock. Close inquiry into these cases will generally reveal the fact that they are the outcome of the craze for obtaining large numbers of day-old chickens, and rearing them in such large batches and under such conditions that only poor development is secured. Of all the inflictions on the poultry industry this is the most potent for evil.

The peculiar feature about this lack of proper development is that it is often not recognised by the farmer whose very existence so much depends upon securing the best possible growth. Some few years ago the imposition of the minimum weight regulation in the Hawkesbury Agricultural College laying competition caused quite a flutter in poultry-farming circles. There was considerable opposition to it, but ultimately poultry-farmers became convinced of the fact that the example was good for them. This opinion still holds good with most, but there is some slackness again in evidence, and many flocks are much below a proper standard of size.

This is the time of the year when the matter of development can be gauged in accordance with weight. Taking the principal breeds that are kept for commercial purposes, White Leghorn pullets between six and eight months old should weigh 3½ to 4 lb., cockerels 1 lb. heavier; while Orpington and Langshan pullets of the same age should scale 4½ to 6 lb., and cockerels 1 lb. to 2 lb. heavier. Most other light and heavy breeds should respectively attain similar weights. I venture the opinion that if poultry-farmers would apply this test to ascertain the development secured in last season's young stock many will find that all is not well.

Development in Relation to Size of Eggs.

It may not be generally recognised that slow development in size means early maturity, and the latter in turn spells an undue number of small to medium size eggs. Poultry-farmers are slowly learning the lesson that the pullets that lay at 4½ months are the root of the small egg trouble. Most of this is preventable.

If the parent stock has been right in respect of size it only remains to secure proper growth in the progeny. On the other hand, if the stock bred from has been undersized, there is only one thing to do, and that is to secure better breeding stock. Presuming the stock is all right, the way to secure proper development is to brood the chickens in small batches, and feed them as laid down in "Rearing and Feeding" (issued gratis by the Department); good conditions and a fair range after the chickens are 10 weeks old will do the rest.

My method of rearing chickens reduces the work to as near an exact science as can be. The trouble, however, in this connection is that some farmers will not conform to the same practice two years in succession, but must try some other way. When it is considered that pullets' eggs generally make 25 per cent. less price per dozen than those of normal size, the loss through small eggs must considerably reduce the average price obtained on many farms. Again, if the small eggs were confined to the early pullets just coming on to lay, the case would not be nearly so serious, but many of the class of birds referred to continue to lay small eggs during their whole lifetime.

Nor should the farmer be deluded into the belief that he has only to introduce a male bird from a flock laying large eggs to get over the trouble in the progeny. The poultry-farmer is not immune from the law that "what a man sows that will he also reap." Once he has introduced a weakness of this kind into his yards, it will take more than one generation to eliminate it. The small birds and small eggs crop up for many generations.

Improve the Stock.

It is only too true that during the past year poultry-farmers have had a bad time. It is equally true that the troubles of many have been intensified by the class of stock being kept and by the management of them. It is a noticeable fact that there is a very general desire—and even keenness—on the part of farmers to improve the quality of their stock; yet the same methods are pursued each year when the only time comes round when steps might be taken to remedy the evils from which they suffer.

For instance, a few pounds judiciously spent in the purchase of new stock during the next couple of months might make a much-needed improvement. The farmer who depends upon cheap day-old chickens for this purpose is not likely to reach the desired end. Does the farmer ever pause to think what quality can be expected in chickens bought for 9d. and 1s. each? The reference here is, of course, to breeding stock. Tens of thousands of such chickens are pedigree-marked, to be used as breeding stock, and many are sold as such, and as so-and-so's strain. It is pathetic to realise what the end will be. It should be understood that pedigrees are worthless unless backed by the quality in the bird or birds under observation.

Many breeders who are distributing stud stock are lacking in knowledge of the breeds in respect of type and character. It is more simple to them

to mark chickens in a mechanical way and supply pedigrees based on blood lines, without regard to the quality of the birds supplied, than to learn the standard for the breeds.

The time is, however, at hand when breeders must acquire the necessary knowledge, or our poultry industry will suffer a severe setback by the loss of type and character, as well as physique. Line breeding and pedigree-marking are all right and proper when carried out by skilled breeders working with good stock. The moral of it all is not to put confidence in pedigrees alone, but to seek to gain that knowledge of the breeds that will be a protection in making purchases.

One particular failing noticeable among poultry-farmers is that they are too satisfied with their own stock, and too busy on their own farms to spare time to visit other farms to inspect stock for purposes of comparison. Such inspection should be directed to good flocks, where it is known that quality is a special feature. In this regard the poultry industry is coming to such a pass that unless there is an improvement it will become a very serious question whether some kind of registration of farms catering for stud business should not be enacted, for the purpose of keeping some supervision over the class of stock being bred for sale to the public.

I would point out that only a small percentage of breeders of poultry (or of other animals for that matter) acquire the knowledge of genetics, together with the skill and judgment necessary for their application, that would constitute them first-class breeders. Many of the most successful commercial poultry-keepers do a good deal of outcrossing, but are particular where their purchases are made. Many others would be better off if they followed this line, and purchased their requirements for breeding stock from skilled breeders.

Seasonable Sowing of Green Feed.

The favourable weather conditions that have prevailed during the last month should have enabled poultry-farmers to prepare the land required for green-feed crops. Where these sowings have not already been made, no time should be lost now in getting them in. The following are seasonable:—Lucerne, Bokhara clover, barley, rape, silver beet and kale.

With regard to barley, many farmers sow this crop much too late. Even the end of February is not too early. It should be sown before the soil gets too cold.

Chilian Clover in Taree District.

Chilian clover (*Trifolium pratense* var. *perenne*) has given good results on Dumaresq Island (Taree district), and the stock are spreading the seed from pasture experiment plots into ordinary pasture areas. The seed germinates readily and the clover appears to be holding its own with paspalum.—J. N. Whittet, Agrostologist.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Central New England P. & A. Assoc. (Glen Innes)	Geo. A. Priest	Mar. 11, 12, 13
Mudgee A. P. H. and I. Association	J. H. Shaw	,, 11, 12, 13
Dorrigo and Guy Fawkes A. Association	A. C. Newman	,, 12, 13
Warialda P. and A. Association	Lanagan Bros.	,, 12, 13
Hunter River A. and H. Society (West Maitland)	J. S. Hoskins	,, 12 to 15
Hastings P. A. and H. Society (Wauchope)	T. Suters	,, 13, 14
Bulladelah Agricultural Bureau	F. Coleman	,, 14, 15
Luddenham A. and H. Society	J. R. Hamilton	,, 14, 15
Batlow A. Society	C. S. Gregory	,, 18, 19
Coonabarabran A. and P. Association	C. D Cox	,, 18, 19
Armidale P. and A. Association	...	,, 18, 19, 20
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Bowraville A. Association	C. H. Sullivan	,, 19, 20
Crookwell A. P. and H. Society	C. H. Levy	,, 20, 21
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Narrabri P. A. and H. Association	E. J. Kimmorley	,, 26, 27
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Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	April 2, 3, 4
Blacktown A. Society	J. McMurtrie	,, 4, 5
Camden A. H. & I. Society	G. V. Sidman	,, 4, 5
Orange A. and P. Association	Geo. L. Williams	,, 8, 9, 10
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 9, 10, 11
Gloucester A. H. and P. Association	F. S. Chester	,, 10, 11
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 14 to 23
Bathurst P. and A. Association	...	,, 30 to May 2
Hawkesbury District A. Association	H. S. Johnston	May 1, 2, 3
Dubbo P. and A. Association	...	,, 7, 8
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 7, 8
Clarence P. and A. Society	L. C. Lawson	,, 7, 8, 9, 10
Narromine A. H. and P. Society	C. E. Skinner	,, 22, 23
Warren P. and A. Association	A. C. Tompson	June 4, 5
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	Aug. 26, 27, 28
Grenfell P. A. & H. Association	Geo. Cousins	Sept. 2, 3
Cootamundra A. P. H. & I. Association	W. W. Brunton	,, 9, 10
Ganmain A. & P. Association	A. R Lhuede	,, 16, 17
Temora P. A. H. & I. Association	A. D. Ness	,, 16, 17, 18
Junee P. A. and I. Society	T. C. Humphrys	,, 23, 24
Corowa P. A. and H. Society	J. D. Fraser	Oct. 3, 4
Berrigan A. and H. Society	R. Wardrop	,, 7
Narandera P. & A. Association	W. H. Canton	,, 7, 8
Deniliquin P. and A. Society	P. Fagan	,, 15

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Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

WHEAT AND OATS EXPERIMENTS, 1923.

Vicinity of Murrumbidgee Irrigation Areas.

A. N. SHEPHERD, Senior Agricultural Instructor.

BARELLAN, the largest wheat-growing centre in the State, being of easy distance from the Irrigation Areas, makes wheat-growing on land adjacent to the Irrigation Area of considerable importance. These lands have been used for the growing of wheat for a considerable number of years, and the more up-to-date methods now being employed are resulting in good returns. Oats are also playing an important part in local farm practice, being more largely used in the rotations, and the earlier maturing and high yielding varieties now available will doubtless result in much larger areas being sown. It is possible, by the use of these varieties, for a farmer to have his oat harvest finished before the wheat is ready for stripping. By using oats in rotation with wheat in place of wheat following wheat, or even bare fallow following wheat, each second year the farmer gets a return and at the same time is able to control diseases peculiar to wheat, such as take-all. Oat grain is also admirably suited for conservation as fodder, being less bulky than hay or chaff, as well as having the advantage of enhanced feed values. If stored in silos, whether concrete or iron, it should be safe from the attacks of mice.

The following farmers co-operated with the Department in the conducting of trials during the season 1923:--

Mr. T. C. Davies, "Parkside," Brobenah, *via* Leeton.
Mr. E. McKenzie, Brobenah.
Mr. E. J. Lovell, Farm 23, Leeton.

The Season.

Following a dry autumn, an exceptionally wet winter was experienced, which had the effect of delaying much of the sowing on the later-sown lands. It was also very noticeable that much of the wheat that was sown early was very dirty with weeds, such as wild mustard, black oats &c. This can be accounted for by the dry time that occurred during the fallow, there not being sufficient rain to germinate the wheat seed and allow of the young plants being killed before the sowing of the wheat. It was also evident that wheat sown before the first shower in May generally suffered much more from flag smut than the crops sown after the rain. Almost invariably the land received a cultivation before the seed was sown after the rain.

The rainfall registrations were as follows:—May, 92 points; June, 533; July, 233; August, 127; September, 151; October, 104; November, 32; total, 1,272 points.

The Plots.

T. C. Davies, Brobenah.—Variety trials with wheat and oats and manurial trials with wheat were carried out here. The land consisted of a red loam; it was fallowed in the winter of 1922, grazed with sheep during spring and summer, then springtoothed and harrowed before drilling on 12th and 13th April, 1923, at the rate of 45 lb. wheat and 1 bushel oats per acre, with 45 lb. superphosphate per acre in the variety trials. In the case of the wheats, Gresley and Waratah germination was very poor, and in no instance was a good stand obtained. The oats gave a satisfactory germination and made good growth. The wheat plots suffered severely in September, owing to a heavy windstorm, much of the straw being broken and the crop thus lost.

RESULTS of Variety Trials.

Variety.	Brobenah. (T. C. Davies.)		Brobenah. (E. McKenzie.)		Leeton.	
	bus.	lb.	bus.	lb.	bus.	lb.
Federation	21	20	22	8	14	30
Bomen	19	45	23	23	11	10
Canberra	18	15	22	44	11	30
Waratah	17	25	18	0	9	10
Gresley	14	15	18	16	7	0
Clarendon	......		22	0	......	
Zealand	......		20	0	......	
Imp. Steinwedel	......		19	18	......	
Hard Federation	......		15	35	......	

RESULTS of Manurial Trials.

Fertiliser per acre.	T. C. Davies. (Bomen.)		E. McKenzie. (Federation.)	
	bus.	lb.	bus.	lb.
70 lb. superphosphate	20	30	21	19
56 lb. „	19	45	......	
45 lb. „	19	45	22	8
No manure	18	0	17	31
30 lb. superphosphate	......		22	50

The oats were less affected, the flag of Lachlan being browned, but quickly recovering. The manured plots showed to very much advantage over the unmanured in the early growth, but the difference was not so marked as the crop matured. These plots were harvested during the first week in December, the oats being stripped a little earlier.

E. McKenzie, Brobenah.—The plot was sown on chocolate soil on 4th and 5th May, 1923. The land had been fallowed since the winter of 1922, and received two cultivations previous to seeding with 45 lb. seed, and a similar

weight of fertiliser per acre. Very good germination was obtained with the exception of Gresley and Waratah, but these made up considerably as the crop advanced. Flag smut was present in the crop, Hard Federation being the most affected. The crop was harvested in the middle of December.

Farm 23, Leeton.—The experiment at this farm, the soil of which is a red clay loam, consisted of wheat variety trials, sowing being carried out on 23rd May at the same rate as on the other plots. The land was fallowed the previous winter, and received a spring-tooth cultivation in the spring and again before drilling. As in the case of the other plots, poor germination was obtained with Waratah and Gresley. Canberra was most affected with flag smut, while all varieties suffered in some degree. The land on which these plots were sown being rather flat, the excessive winter rain had a bad effect on the crop, greatly reducing the yields. The plants were also damaged by the windstorm in early spring, the effect being especially noticeable in the case of the thin crops.

All wheat seed was pickled in 1 per cent. solution of copper sulphate.

Southern District.

E. S. CLAYTON, Agricultural Instructor.

DURING 1923 the Department conducted experiments with the following farmers:—

H. W. Belling, "Bexley," Lockhart.
J. Busch, "Naradhun," Hillston.
Carew Bros., "Selbourne," Deniliquin.
G. C. Perry Circuitt, "Uabba," Lake Cargelligo.
P. Corcoran, "Weeroona," Moombooldool.
D. and J. Gagie, Spy Hill, West Wyalong.
W. Glenn, "Minerva," Thyra-road, Mathoura.
G. Gow, "Hughenden," Barellan.
Hobson Bros., "Glenlee," Cunningar.
A. G. Jennings, North Berry Jerry.
Johns Bros., "Woollongough," Ungarie.
H. B. Manning, "Ravenstone," Barellan.
W. J. Martin, "Rotherwood," Barellan.
M. C. McCrone, "Bungambil," Mirrool.
R. H. Thackeray, "Woornack," Young.
W. Thornton, "Spring Farm," Berrigan.
T. W. Turner, "Kia Ora," Lake Cargelligo.

In all twenty-three experiments were planted in the southern district, but comparable results were not obtained at Binya, Cunningar, Hughstonia, Wallendbeen, or Yuluma, chiefly on account of the delay at planting time caused by continuous rains.

Cultural Details.

Barellan (G. Gow).—Fairly heavy red loam, uncropped for two years. Ploughed and harrowed in September, springtoothed in November, harrowed December and again prior to sowing; seed-bed in good order. Sown 21st May with 50 lb. seed and 56 lb. superphosphate per acre.

Barellan (H. B. Manning).—Red clay loam. Ploughed August, harrowed September and March; surface rather too fine and inclined to run together. Sown 25th May with 50 lb. seed and 56 lb. superphosphate per acre; harrowed after sowing.

Barellan (W. J. Martin).—Light red loam. Fallowed in July, harrowed October, January, and again in February, and springtoothed prior to sowing. Sown 23rd May with 50 lb. seed and 42 lb. superphosphate per acre.

Berrigan.—Strong red loam, two years without crop. Fallowed in July, harrowed September, rolled March, springtoothed April and harrowed twice in May. Sown 16th May with 50 lb. seed, and 56 lb. superphosphate per acre.

Cunningar.—Light loam. Ploughed September, harrowed twice in October, springtoothed February, and again twice prior to sowing. Sown 22nd June with 60 lb. wheat, 56 lb. oats, and 50 lb. superphosphate per acre.

Deniliquin.—Strong loam. Fallowed in July, disced and rolled March, springtoothed April. Sown 17th May with 50 lb. seed and 56 lb. superphosphate per acre.

Hillston.—Deep red sandy loam; fallow rather loose. Sown 7th May with 50 lb. seed and 23 lb. superphosphate per acre.

Lake Cargelligo (G. C. P. Circuitt).—Dark red loam of light texture and about 10 inches deep. Ploughed June, harrowed December and January, disced March, harrowed April; fallow rather loose. Sown 4th May with 50 lb. seed and 42 lb. superphosphate per acre.

Lake Cargelligo (T. W. Turner).—Light red sandy loam. Ploughed July, disced October, springtoothed December; sheep kept on fallow. Sown 3rd May with 50 lb. seed and 56 lb. superphosphate per acre.

Lockhart.—Heavy red loam. Fallowed in August, springtoothed in September, disced in April, and springtoothed before sowing. Sown 25th May, light harrows following the drill, with 56 lb. seed and 56 lb. superphosphate per acre.

Mathoura. Heavy red loam, virgin land. Ploughed August, harrowed October and again early in May. Sown 7th May with 50 lb. seed and 45 lb. superphosphate per acre.

Moombooldool.—Loose red sandy loam (mallee). Fallowed in August, springtoothed October, skim-ploughed May. Sown 24th May with 50 lb. seed and 56 lb. superphosphate per acre.

North Berry Jerry.—Red clay loam. Ploughed in July, springtoothed and harrowed prior to sowing; fallow heavily stocked with sheep and in excellent condition at time of sowing. Sown 27th April with 50 lb. wheat, 45 lb. oats, and 56 lb. superphosphate per acre.

Ungarie.—Light red loam. Fallowed in May, springtoothed September and October, harrowed twice in January, and again in February; soil in good order but rather fine. Sown 31st May with 50 lb. seed and 45 lb. superphosphate per acre.

West Wyalong.—Heavy red loam. Ploughed September; kept heavily stocked with sheep; fallow in excellent order at time of planting. Sown 24th April with 50 lb. seed and 42 lb. superphosphate per acre.

Young.—Fairly heavy red loam. Ploughed September, cultivated with set duck-feet cultivator in January and again in March, and harrowed prior to sowing. Sown 30th June with 60 lb. seed and 70 lb. superphosphate per acre.

The Season.

The autumn of 1922 proved exceptionally dry, no rain whatever being registered during February, March, and April in many localities. When the drought finally broke in May, too much rain was received; in fact, in some localities it rained almost continuously for eight weeks.

RAINFALL.

	May.	June.	July	Aug.	Sept	Oct.	Nov.	Dec.	Total for Growing Period.	Total Rainfall on Fallow.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Barellan—G. Gow ...	89	519	271	74	110	73	...	...	1,136	626
Barellan—H. B. Manning	...	527	265	50	88	74	...	...	1,004	...
Barellan—W. J. Martin ...	...	482	207	63	82	120	76	...	1,030	791
Berrigan	159	374	306	68	89	173	12	...	1,181	632
Cunningar	...	818	363	148	545	301	195	343	2,716	1,056
Deniliquin	166	416	372	70	60	150	15	...	1.199	...
Hillston	45	399	261	46	20	25	11	..	807	...
Lake Cargelligo—G. C. P. Circuitt.	80	569	280	51	68	237	63	...	1,348	923
Lake Cargelligo—T. W. Turner.	62	540	252	36	47	111	170	...	1,218	...
Lockhart	...	611	204	97	169	149	62	...	1,292	579
Mirrool	...	547	219	27	228	132	59	219	1,431	890
Moombooldool	...	621	247	71	136	137	61	...	1,273	712
North Berry Jerry ...	82	658	343	122	310	170	80	21	1,786	676
Ungarie	...	574	196	54	173	171	60	182	1,410	...
West Wyalong	68	586	183	73	148	164	58	...	1,280	676
Young	...	...	270	155	266	261	160	99	1,211	1,070

The season experienced was quite unusual for the southern district, and the results are very variable, tremendous differences being seen in crops sown before and after the rains. Quite a remarkable growing season was experienced in most parts of the district. In place of the hot, dry weather usually experienced in early summer, the weather was cool and showery. The absence of hot, dry westerly winds resulted in the heads being well filled with plump grain, and some very heavy yields were recorded, especially in the eastern portion of the district. The mild showery weather prolonged the growing season, and enabled practically all the late-sown crops to mature. Harvesting was later than usual throughout the district.

In some cases where the excessive rain delayed the planting until July and August, some heavy yields were obtained even from late-maturing varieties because of the weather. In a normal season high yields from late-maturing varieties planted so late in the season would be quite impossible.

The season was rather favourable to the development of flag smut, the extremely dry autumn preventing the germination of the spores until the wheat was sown, heavy infection consequently resulting. In a normal season a large percentage of the spores would germinate prior to the sowing of the wheat, and lacking a host, would perish. Crops sown prior to the rains suffered to a greater extent than those sown later. Federation and Canberra showed a high percentage of infection in most localities.

Notes on Varieties.

Early Bird, Riverina, Wandilla, and Union (varieties recently produced by the Department) were tried for the first time extensively in the southern district, and of these varieties *Union* (Federation x Cowra 15) has been wonderfully successful. Except in one centre, it gave the highest yield wherever tried, proving very adaptable to different soils and conditions. It closely resembles Federation. The straw is strong and of medium height, the ear brown, slightly tapering, fairly dense and awnless; the variety does not shell, withstands bad weather, and is very satisfactory to harvest. Union does not appear to be so liable to flag smut as Federation.

Early Bird is a very early variety. It is a sparse stooler with straw of good height; it is inclined to lodge and somewhat inclined to shell when harvesting is delayed. The ear is white, rather tapering, with a slight tip awn. Early Bird demonstrated its value as a hay wheat in the dry districts. At Lake Cargelligo it made wonderful growth and was ready to cut for hay very early in the season.

Riverina is a sparse stooler; the straw is of medium height, the ear white, tapering and with a slight tip awn. This variety gave consistent yields wherever tried, and at two centres (both in the Barellan district) it was the highest yielding variety.

Wandilla is a mid-season dual-purpose variety with strong straw; the grain is rather hard to thresh. The variety yielded well at all centres and was the highest yielding variety at Deniliquin and North Berry Jerry.

The yields of Federation and Canberra were considerably reduced this season at most centres by flag smut, to which disease these varieties appear to be particularly susceptible. The yield of Gresley was reduced at all centres by the poor germination, due probably to injury of the seed during the pickling process.

Manurial Trials.

The object of the manurial trials is to obtain data regarding the most profitable rate of application of superphosphate at various localities in the southern district. The application of fertiliser is so general in this portion

VARIETY Trials.

	Barellan—G. Gow.	Barellan—H. P. Manning.	Barellan—W. Martin.	Berrigan.	Cunningar.	Deniliquin.	Hillston.	Lake Cargelligo—G. C. P. Circuitt.	Lake Cargelligo—T. W. Turner.	Lockhart.	Mathoura.	Mirrool.	Moombooldool.	North Berry Jerry.	Ungarie.	West Wyalong.	Young.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	11 20	...	15 21	...	...	...	...	...	...	23 37	...	32 13	...	23 20	21 18	25 20	37 4
Canberra	22 20	23 30	12 13	13 20	19 7	11 0	8 48	19 43	19 15	23 28	23 0	24 40	11 25	19 52	20 0	21 56	34 56
Currawa	21 36	17 24	...	...	8 48	...	5 40	...	12 21	...	...	...	15 20	28 12	...	...	...
Dollar	...	...	...	20 57	...	...	...			...	...	...	...	...	...	...	...
Early Bird	...	...	11 40	...	...	15 20	14 35	12 47	15 20	16 12	...	23 28	10 33	...	11 8	15 24	...
Federation	22 24	20 53	12 53	18 37	17 41	13 31	6 15	22 37	18 11	23 7	24 57	31 12	13 12	28 4	20 0	20 16	...
Florence	...	...	...	...			16 2	...	...	...	...	...	12 29	...	...	...	...
Gallipoli	...	...	...	...	...	...	...	...	...		27 0	...	...	...	...	...	...
Gresley	20 56	17 32	12 20	10 0	17 29	6 24	11 15	17 9	14 0	9 4	11 39	24 43	10 56	18 48	10 50	21 40	29 52
Hard Federation	...	...	...	...	22 43	...	...	19 29	...	21 54	24 11	...	...	...	...	...	34 32
Huff's Imperial	...	...	...	...	...	...	...	...	...	...	27 31	...	...	...	...	...	...
Improved Steinwedel	...	...	...	...	22 48	...	...	16 16	13 34	...	15 39	22 36	12 37	...	...	...	...
Major	13 44	20 12	10 12	16 43	19 7	...	8 57	22 31	14 0	19 39	23 9	30 37	...	...	11 0	...	32 56
Marshall's No. 3	...	...	...	...	17 44	...	...	...	...	...	...	...	...	27 52	...	...	...
Onas	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21 20	...
Riverina	30 8	...	16 30	...		...	...	...	17 40	20 8	18 33	...	...	20 0	...	23 56	31 32
Rymer	...	...	5 4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Union	...	25 34	...	21 14	...	...	20 5	...	...	26 21	...	...	14 27	...	22 0	26 0	39 4
Wandilla	22 9	23 14	...	...	21 47	18 8	...	...	...	21 7	...	...	...	30 8	...	24 30	34 16
Waratah	22 57	21 53	14 4	16 52	22 40	16 54	14 35	19 14	18 33	22 1	20 47	29 1	13 25	26 8	22 0	24 52	32 40
Warren	...	...	...	...	...	...	...		13 42	...	...	...	...	...	...	...	...
Yandilla King	...	...	...	...	17 41	...	...	...		...	...	...	...	...	...	...	38 16

of the State that plots receiving no manure were not included in the trials except at a few centres.

At Barellan (on heavy red loam and also on light red loam), Berrigan, Lake Cargelligo, Lockhart, and North Berry Jerry the results indicate that an increase in the amount of superphosphate applied is unprofitable, while at Cunningar, Deniliquin, Barellan (red clay loam), Mathoura, Moombooldool, West Wyalong, and Young an increase in the amount of superphosphate applied resulted in a considerable increase in yield. At Moombooldool on loose sandy loam (mallee) an application of 125 lb. of superphosphate gave an increase in yield of 50 per cent.

Farmers should not be guided entirely by the results of this year's fertiliser experiments, as the season was quite exceptional. At the same time these results substantiate those obtained in previous years, which show that in certain centres an increase in the amount of superphosphate applied is profitable according to the soil and climatic conditions.

MANURIAL Trials.

	Amount of Superphosphate per acre.											
	Nil	28 to 30 lb.	40 to 45 lb.	50 to 52 lb.	56 to 58 lb.	60 to 65 lb.	70 to 75 lb.	80 to 84 lb.	90 lb.	98 to 100 lb.	112 lb.	125 lb.
Barellan—G. Gow	..	25 21	...		22 24		..	21 30	.	..	...	..
Barellan—H. W. Manning	...	...	...	.	20 53	..	.	22 24	...	..	...	...
Barellan—W. J. Martin.	..	...	12 53		...	...	14 7	..	...	..	16 13	..
Berrigan... ..	...	...	...	18 37	...	..	17 36	...	..	18 12	...	...
Cunningar ..	13 41	..	...	..	17 41	..	...	.	..	...	19 16	...
Deniliquin ...	...	..	..	..	13 31	...	...	14 12	..	..	...	...
Hillston	...	6 15	8 3	...	6 48	..	.	...	..	...	...	...
Lake Cargelligo—G. C. P. Circuitt.	...	...	22 37	...	23 0	..	20 40	...	...	...	..	...
Lake Cargelligo—T. W. Turner.	...	...	...	...	18 11	...	..	18 25	...	...	18 52	...
Lockhart ...	17 41	...	.	...	23 7	..	..	...	23 5	...	..	...
Mathoura ..	21 43	...	24 57	..	..		21 10	.	...	26 38	...	...
Mirrool	...	...	31 12	..	...	31 3	..	31 53	..	...	..	...
Moombooldool ...	...	...	..	.	13 12	...	13 24	..	.	...	...	19 3
North Berry Jerry.	...	...	..	.	28 4	30 0	27 8	27 0	..	...	...	...
Ungarie	...	...	20 0		...	24 0	...	21 20	..	...	..	..
West Wyalong ...	...	...	19 51	21 56	...	19 20	...	22 8	...	..	.	...
Young	26 8	32 32	..	.	...	..	34 53	...	...	..	37 24	...

Fungicide Test.

At West Wyalong an experiment was conducted with Federation to test the merits of treating seed wheat with copper carbonate in comparison with bluestone and lime treatment. Both plots were free from bunt. They yielded at the rate of 20 bushels 32 lb. and 20 bushels 16 lb. respectively, showing a slight increase in favour of the copper carbonate treatment.

By employing the dry method, seed wheat can be treated some time prior to sowing and at a more convenient time. The method also enables sowing to be carried out in a dry seed-bed without injury to the seed.

Fallow Experiment at Barellan.

A fallow experiment was again carried out on Mr. W. J. Martin's property at Barellan. The experiment was located about 10 miles north of Barellan on light red loam (Yarran and pine country), and consisted of 25 acres, divided into five blocks of 5 acres each. The blocks were treated as follows :—

Block 1. Ploughed in July; no further cultivation until sowing.
Block 2. Ploughed in July: harrowed October, January and February.
Block 3. Ploughed in August; harrowed October, January and February.
Block 4. Ploughed in September; harrowed October, January and February.
Block 5. Ploughed in October; harrowed October, January and February.

All blocks were springtoothed prior to sowing. The plots were heavily stocked with sheep during the fallow period. The experiment was sown on 24th May with Federation at the rate of 50 lb. per acre, superphosphate at the rate of 45 lb. per acre being applied to each block. The rainfall for the growing period of the crop was 1,030 points. The results were as follows :—

Treatment.	Rainfall on fallow.	Yield per acre. bus. lb.
Block 2. July fallow (worked)	791 points	14 2
Block 1. July fallow (unworked)	791 ,,	13 12
Block 3. August fallow (worked)	663 ,,	12 44
Block 4. September fallow (worked)	553 ,,	12 44
Block 5. October fallow (worked)	466 ,,	11 8

The results this season substantiate those obtained the previous year. The figures clearly indicate the advantages of the earlier fallowing. Even on the July fallow, which received no after-cultivations to conserve the stored moisture, heavier yields were obtained than on the block fallowed a month later.

The yield of block No. 2 when compared with that of No. 1 does not constitute a sufficient increase to warrant the extra cost of the cultivations at the present price of wheat. The previous year's results showed an even smaller gain, only 11 lb. increase being obtained as a result of the extra cultivations on the July fallow blocks.

The rainfall column shows the advantage of the earlier ploughing in the amount of moisture stored in the soil. The earlier the land is ploughed the greater the amount of winter rainfall conserved in the soil. The soil, moreover, is in good condition for germinating the black oat seeds over a longer period, thus inducing their early and effective germination, when they can be easily destroyed.

Seeding Test.

At Mathoura a seeding test was conducted with Federation. The experiment was sown on 9th May and the results were as follows :—

Federation, 80 lb. per acre ... 26 bus. 54 lb. per acre.
Federation, 60 lb. per acre ... 24 bus. 23 lb. per acre.

This experiment will need to be conducted for a few years before definite conclusions can be drawn.

Oat Variety Trials.

Oat variety trials were conducted at Barellan (W. J. Martin), Cunningar, Mathoura and North Berry Jerry. Quondong and Mulga, the two early varieties that were so successful the previous year, again demonstrated their ability to yield well. This fact, combined with their early maturity, makes these varieties particularly valuable.

Although Algerian gave the heaviest yield at North Berry Jerry, the appearance of the plots indicated that had it been possible to harvest the Mulga and Quondong plots as soon as they were ripe, both varieties would have outyielded the Algerian. The yields were as follows:—

Variety.	Mathoura.	Barellan (W. J. Martin).	Cunningar	North Berry Jerry.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	28 36	16 13	29 20	50 4
Lachlan	....	24 4	....	....
Mulga	32 23	16 13	27 14	34 34
Quondong	43 26	19 13	....	33 20

"The Nature and Properties of Soils."

UNDER the influences of climate the outer solid portions of the earth readily pass into a loose and disintegrated mass, which, though superficial and insignificant in comparison with the bulk of the earth, performs the marvellous function of maintaining life in its great abundance and immense variety as we know it. Inevitably the character of this superficial layer of matter depends in no small degree on the character of the rock that underlies it, but other factors—numerous in themselves and highly complex in their actions—also enter, the result being the endless variety of soils with which man has to deal in the production of his needs from the earth's surface. Moreover, the soil, like the life it sustains and nourishes, changes continuously so that "the soil of to-day is not the soil of yesterday, nor will it be the soil of to-morrow. It is never still. It is continually seeking a mechanical adjustment with the forces which surround it or are active within its precincts," but that equilibrium is never attained, and hence change goes ceaselessly on. "It is this continual change and this endless response to environment that makes the soil useful to plants."

"In the light of its origin and function, the soil may be defined as a mixture of broken and weathered fragments of rock and decaying organic matter, which covers the earth in a thin layer and supplies mechanical support and in part sustenance to plants." Under investigation, new functions and new and unsuspected relationships are brought to view until the story of the soil becomes increasingly engaging and delightful.

It is these various functions and relationships that occupy the 588 pages of a most comprehensive work under the above title, of which the authors are T. Lyttleton Lyon and H. O. Buckman, both professors of soil technology at Cornell University.

The soil-forming processes, the different classes of soil, and the principles of manuring and maintaining fertility, are fully discussed, and many practical suggestions are made at each step. The work, which is in the nature of a text-book, cannot fail to be of the greatest value to students of agricultural science.—Our copy from the publishers, The Macmillan Company, New York

Field Maize Competition.

The Inverell Pastoral and Agricultural Society.

H. WENHOLZ, B.Sc. Agr., Special Agricultural Instructor.

Following the success of the field wheat competitions held by different agricultural societies in the State, the Inverell Pastoral and Agricultural Society last season took the initiative in devising a field maize competition on similar lines. To this society, therefore, belongs the credit of introducing a properly organised effort to improve the local agricultural practice with this crop on these lines. Other agricultural bodies, in common with this society, have previously conducted seed maize contests in which competitors submit a certain quantity of their seed maize to be tested under identical conditions on an approved farm or farms in the district, with the object of determining the source of the best yielding variety and strain of seed in the district. Some other agricultural societies have conducted maize competitions for the highest yield per acre, which have largely had the effect of determining the lucky possessor of the richest soil in the locality, and have not been continued very long, because unfortunate (but quite good) farmers with poorer soil have been discouraged from competing on account of having no chance from the outset. Such competitions apparently have no great ulterior educational motive, nor do they achieve any tangible results in this direction. Some few agricultural societies or bodies have also instituted boys' maize-growing competitions in which, in addition to yields, cultivation methods are taken into consideration in determining the merit of the crop. These are certainly a step forward, and deserve every encouragement.

The present competition, however, might be regarded as the highest activity an agricultural society or similar body can undertake from the standpoint of agricultural progress and betterment, since it draws attention to every phase in the growing of the crop which has a direct influence on yield.

Further, there is a strong incentive for a large number of maize-growers to enter a competition of this kind, quite apart from the value or hope of a prize. In the first place, when other factors in addition to yield are taken into consideration, there is every chance of a farmer who is unfortunately not blessed with the best of land securing a premium or a good place in the award. Secondly, the competitor who comes last or scores low in such a competition has usually the most to gain from the educational standpoint. The far-reaching effects on the agricultural progress of the district also amply justify an agricultural society in promoting such competitions, quite apart from the discussions among farmers when they meet at show time.

The newly appointed secretary of the Inverell Pastoral and Agricultural Society (Mr. W. Maidens) conceived the idea of conducting such a competition, and he made a request to the Department of Agriculture for the services of one of its field officers to act as judge. Between the departmental officer

and the sub-committee of maize-growers appointed by the society a tentative scale of points was drawn up for trial during the first year, it being intended that improvement should be suggested after actual experience with it.

The Scale of Points.

The scale of points used in the present contest was designed on a similar scale to that used fairly satisfactorily in judging wheat crops, taking into consideration that in the present season the ten acres of maize submitted for judging would not be in any way specially grown, but would be portion of a field crop of a larger area, and also considering the conditions peculiar to the district under which maize is grown. For the present, then, this scale of points is not recommended as the best, nor is it designed to apply to any other district but Inverell, where the conditions for maize-growing differ somewhat markedly from those of any other part of the State:—

1. General condition and appearance.—Maximum 20 points for land cropped five years or under, with an additional four points for each five years the land had been under cultivation up to fifteen years.
2. Cleanness of cultivation.—Maximum 24 points for the first or second successive maize crop, and an additional four points for each successive maize crop on the land.
3. Freedom from disease and insect pests.—Maximum 10 points.
4. Purity of seed and trueness to type.—Maximum 10 points.
5. Apparent yield.—Three points for each five bushels of estimated yield.

The points for purity of seed and trueness to type were allotted partly on a field examination, but finally on an exhibit of ten selected cobs shown at the society's annual show during the first week in March. The judging of the crops in the field took place during the previous week.

The Season.

In describing the season for maize it is beginning to be recognised that the weather conditions dating back to the first ploughing of the land after the previous season's crop have such an effect on the maize crop under review that they demand due consideration.

The Inverell district suffered during the first half of 1923 in having one of the driest times on record—only about 6 inches of rain falling from January to May. It was not until nearly 4 inches of rain fell in June that any sort of promise was given for the following season's maize crop. About 2 inches in July, a practically rainless August, 3 inches in September, and 2 inches in October, and most of these falls followed by dry westerly winds, did not generally give much moisture in the soil before the crop was sown. Then a dry November and early December, with more and hotter winds, just about put the Inverell district in the position that the maize crops were almost doomed, when the long dry spell finally and definitely broke on 21st December, and over 4 inches of rain were recorded up to the end of that month. This was followed by hot, dry weather again for a fortnight in January, when many maize crops tasselled which had been sown in October, and the

setting of the grain on these crops was noticeably faulty. About 2½ inches fell altogether in January and nearly 8 inches in February, when most of the crops judged were assured of sufficient moisture in the soil to properly fill the grain. This rain during February caused the first good saturation of the subsoil in the Inverell district since the spring of 1922.

Under the seasonal conditions mentioned above, the September sowings of maize which tasselled before the Christmas rains were not very good. Except in a few instances, where the land was ploughed early (in autumn or early winter), the yields of September-sown maize did not exceed 30 bushels per acre, but with October sowing the yields of many fields ran to 40 or 45 bushels. Such circumstances do not, however, form any criterion as to the best time for sowing maize in this district.

The Crops.

H. W. Parmenter, Alvadale.—The soil here was a medium heavy black loam, which had been under cultivation eleven years. The previous crops on this land were wheat, oats, and maize, so that it was four years since the land had carried a maize crop. The land was ploughed after the wheat in July and sown (ploughed in) during the third week in September. Mr. Parmenter had two entries, one of Silvermine (a white maize), and the second of Reid's Yellow Dent. Both crops were in the same paddock, and each showed considerable mixture of colour in the grain. On the first plot the stand was not very good, and, particularly in the thin places, weeds were showing—Bathurst burrs, paddy melons, a few Noogoora burrs, and black oats. The yield was estimated at 30 bushels per acre. The second crop was a little better stand, less weedy, chiefly couch grass and wild hibiscus, but many cobs showed imperfect filling, as if the crop had suffered from dry, hot winds or from the attacks of Rutherglen bugs during the flowering stage. The apparent yield was 40 bushels.

Frank Brown, Lorraine.—This crop was on land which had been under cultivation for eight years, and which had grown wheat the previous season. The soil was irregular, consisting of red and light black loam of basaltic origin. The crop showed much unevenness, due to the varying nature of the soil, besides having a thin stand through many parts and being badly blighted off in places, but it was practically free from weeds throughout. The yield was good in patches, but the average was estimated at 30 bushels.

F. Morris, Staggy Creek.—The soil here was of dark granite to a light black volcanic nature which had been under cultivation for nine years. The previous crop was maize, which had failed, but which had been given good cultivation, and the land was then ploughed in August, and the crop planted at the end of October with the variety Auburn Vale (a locally adapted strain of Red Hogan). The stand was fairly good, but thin in patches, and the profuse suckering indicated that thicker sowing could have been made on this soil, which is evidently stronger than it appears. The crop was kept fairly clean, except for paddy melons and sneezeweed. The indicated yield was 40 bushels.

Thomas Bros., Gum Flat.—Light to heavy black soil, thirty years under cultivation; previous crop oats. Ploughed in May before winter rains, and planted about the end of October. The variety sown was Improved Yellow Dent or Fitzroy, a well-known coastal variety of maize which has apparently been well adapted by long selection (twelve years) to the conditions here. The crop was exceptionally clean, even, and with a good stand. It promised a yield of 45 bushels per acre.

Leslie Bros., Inverell.—Heavy black flat, which had been under cultivation for forty five years. The last crop was maize, after which the land was ploughed in June and sown about the end of October with the variety Auburn Vale. This was also one of the cleanest crops seen, due to the promptness of cultivation after the Christmas rains. The stand was exceptionally good and the crop very even. Unfortunately a severe windstorm in January bent most of the crop and broke many stalks, spoiling the look of what must have been the show crop of the district. Nevertheless, despite the blowing about it received, the crop was still estimated to yield 45 bushels.

F. B. Hawke, Auburn Vale.—Dark chocolate hill soil, under cultivation for eleven years; previously cropped with wheat and hay for several years. Ploughed first in March (shallow) and again in September (deep); sown during the second week in October with the variety Red Indian (a darker red-grained variety than Red Hogan). This crop was moderately weedy, with paddy melons, pigeon grass, and black oats. The stand was fairly good except for a few thin places, and the crop was quite good except on a thin ridge where the yield was much reduced, and which pulled down the average to 40 bushels.

E. M. Griffin, Spring Creek.—Soil, a dark-red stony basalt, which had been cultivated for twenty years, the last crop being maize. The land was ploughed in July and planted in September. This crop was fairly weedy, with paddy melons, ivy weed, couch grass, barnyard grass, wild hibiscus, and Prince of Wales feather. The seed was a mixed type of Prairie Queen, and the yield promised only barely 30 bushels.

E. R. Forsyth, Nullamanna.—This crop was on red basaltic soil; the land had been down in pasture for six years, and the present crop was the first return to crop. The ground was ploughed in August and sown at the end of September with the variety Hickory King. The stand was very thin and patchy, very uneven, and showed poor condition, with poorly fertilised cobs. The crop had become badly infested with couch grass, summer grass, Bathurst burrs, paddy melons, wild hibiscus, and ivy weed. The yield was estimated at only 20 bushels per acre.

Thos. Gray, Nullamanna.—Virgin dark chocolate volcanic soil was used for this crop, which was part of a paddock of 60 acres. The stand was fairly good, though some patches were very thin. This crop had apparently not been given much cultivation, as it had become fairly weedy with native blue and sugar grasses, Bathurst burrs, nettles, paddy melons, and redlegs. There was also a fair amount of rust observed on the leaves of the crop, which was

of the Silvermine type, but which, despite its defects, promised a yield of 40 bushels per acre.

Jas. Marchant, Valma.—This soil was of a dark chocolate to black volcanic nature, which had been under cultivation for twenty-eight years, and had previously grown a crop of wheat. The land was ploughed in February, again in July, and again in August, and was sown about mid-September with Leaming maize. The stand here was very good, and it was the most carefully planted plot inspected, the maize being sown very regularly in "hills" about 3½ feet apart. The field was moderately weedy in parts, chiefly with bindi-eye and wild hibiscus. This was one of the best yielding of the September-sown plots, being estimated to yield 40 bushels per acre. The field did not appear to be of the minimum size of 10 acres required for the competition.

Mr. Marchant had a second plot of similar soil, which had been under cultivation for over thirty years, and on which the present crop was the third successive maize crop. This land was ploughed in July, and was sown about the same time. The crop here was cleaner, except for some couch grass in places and a little bindi-eye and wild hibiscus, but it did not appear as healthy as the former crop, and the yield was set down at 35 bushels.

Mr. Marchant had topped portions of both his crops with the sole idea of increasing the yield—a practice of which he seemed to be fairly well convinced of the efficacy, but which is much open to question.

G T. Butler, Ormonde Vale.—The soil ranged from light gravelly red to a heavy black volcanic flat, which had been under cultivation for fourteen years, and which had previously grown a crop of wheat. The land was ploughed in February and again in July, and was planted during the first week in October. On the heavy soil the crop was exceedingly good, being estimated to yield over 60 bushels per acre; some of the cobs (the variety being Funk's Yellow Dent) were the finest ever seen in the Inverell district. This part of the field occupied about 3 acres only, and did not show a good germination, such land being apparently capable of carrying a heavier stand, for some of the plants had developed four or five suckers. Here also the crop was weedy, with many Bathurst burrs and some bindi-eye. On the lighter soil the crop was far cleaner, except for some stink-grass, which has lately made its appearance to a large extent in the Inverell district. The yield receded here to 35 bushels per acre, making an average yield of about 45 bushels per acre for the whole crop of 10 acres.

Jock Lyall, Oakwood.—The soil was of a dark chocolate nature, which had been twelve years under cultivation, and had previously grown wheat and maize alternately for some years. The land was ploughed in March and again in September, and was sown at the end of October. Two varieties were entered, the first crop being Golden Glow. This crop was moderately weedy, with paddy melons, bindi-eye, pigweed, ivy weed, summer grass, and sneezeweed, somewhat induced by the rather poor stand. In view of the poor stand the yield was fairly good, being estimated at 30 bushels.

The second crop was not so weedy, the variety here being Fitzroy, and the apparent yield 40 bushels per acre.

J. Ditzell, Inverell.—Heavy black flat, which had been forty-six years under cultivation, and on which the present crop was the fifth successive maize crop. This is very strong land and quite capable of growing several successive maize crops. Owing to the conditions governing the competition, this crop had a possible maximum of eight more points than any other competitor for cleanness of cultivation, and as it was not greatly troubled with weeds, with the exception of some wild hibiscus and a few odd burrs, it scored more heavily than any other crop in this regard. The land was ploughed in August, and was sown with Funk's Yellow Dent about the end of October. The crop suffered somewhat in condition by many cobs being imperfectly set with grain, despite which, however, it promised a yield of 40 bushels.

A. Pennington, Dog Trap.—This also was heavy black soil, which had been under cultivation for over thirty years, and had grown wheat the previous season, after which the land was ploughed, first in January and again in August, and planted about mid-October with Funk's Yellow Dent. This crop promised a very good yield in parts, but in other places the cobbing did not come up to expectation from the growth of the stalks, dry weather at tasselling on top of too fast growth being responsible for this condition. The crop was fairly clean, except in some thin places, where there were a few burrs, bindi-eye, pigeon grass, and sneezeweed. The crop was so good in most parts that a yield of 45 bushels was forecasted.

THE POINTS SCORED.

Name.	Variety.	Condition and appearance.	Cleanness of cultivation.	Freedom from disease and insect pests.	Apparent yield.	Purity of seed and trueness to type.	Total.
		Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Thomas Bros., Gum Flat	Fitzroy ..	30	23	10	27	8	98
Leslie Bros., Auburnvale-road .	Auburnvale (Hogan).	26	22	10	27	9	94
J. Ditzell, Inverell	Funk's Y.D.	22	28	9	24	10	93
A. Pennington, Dog Trap ..	do .	26	18	9	27	10	90
G. T. Butler, Ormonde Vale	do ..	18	20	10	27	9	84
Jas. Marchant, Valma	Leaming ..	26	16	9	24	9	84
Do do .. .	do ..	23	24	6	21	9	83
F. B. Hawke, Auburnvale ..	Red Indian	22	18	8	24	9	81
H. W. Parmenter, Alvadale .	Reid's Y.D.	22	20	9	24	6	81
Jock Lyall, Oakwood .. .	Fitzroy ...	23	18	8	24	5	78
H. W. Parmenter, Alvadale ..	Silvermine.	21	18	9	18	8	74
F. Morris, Staggy Creek ..	Auburnvale (Hogan).	20	20	9	24	...	72
Jock Lyall, Oakwood	Golden Glow.	17	16	10	18	9	70
Thos. Gray, Nullamanna .	Silvermine .	15	16	7	24	6	68
Frank Brown, Lorraine... ..	Mastodon Whitecap (Crossbred)	14	24	8	18	...	64
E. M. Griffin, Spring Creek ..	Prairie Queen.	22	16	8	18	...	64
E. R. Forsyth, Nullamanna ...	Hickory King	11	12	7	12	...	42

Messrs. Thomas Bros.' win in this competition was full of merit, being a triumph of good farming. But for the unfortunate windstorm which swept through their crop, Messrs. Leslie Bros., whose crop was lowered by fully 10 bushels on this account, and who had also to lose points on appearance, would have had easily the show crop of the district.

Although other crops came lower down the list, many of the farmers concerned had some particularly good points about their crops which deserve mention. Outstanding among these were the cleanness of cultivation of Mr. Frank Brown's crop, the careful planting methods of Mr. Jas. Marchant, the excellent growth of part of the crop of Mr. G. T. Butler, and the good crop of Mr. F. Morris on light soil.

As one of the conditions was that each competitor should exhibit ten cobs at the local show, to be judged for purity of seed and trueness to type, and some did not show, no points were scored by them under this head.

General Observations.

Such a competition would not be complete without some observations on the farming methods of the district, particularly as applied to the culture of maize, for it is the educational value of such competitions which is their best feature.

Cultivation Methods.—The general practice with regard to rotation of crops in the Inverell district may, on the whole, be considered quite good. In very few cases (and the crop was taken somewhat at random in this competition) had maize been grown successively on the land, although the land was quite strong enough to stand this practice for a few years at least.

In most cases the maize crop judged followed a crop of wheat, but there was much variation among the competitors in the time of ploughing of the land. It was observed, as would to some extent be expected, that land ploughed in autumn or early winter, so as to get the benefit of complete ingress of the winter rains, had much advantage over later-ploughed land, and it was largely on the former that not only were the best yields made, but where also the crop was most free from weeds. Moisture considerations are the most important feature in the ploughing practice, and this better reception and conservation of moisture by early ploughing is generally reflected in better yields. The maize crop also, however, must be looked upon as an opportune crop to rid the land of weeds (particularly black oats) for the subsequent wheat crop, and the success which is achieved in this regard is to a large extent determined by the kind of cultivation given to the land before the maize crop is sown.

Planting.—The methods of planting maize on the heavy black soils in the Inverell district have perforce to be somewhat different to most other maize-growing districts, and it has been found from experience that ploughing in the seed is about the most successful practice under such conditions. This has undoubtedly led to a carelessness in the regularity of the distribution of the seed along the rows which would not be tolerated in other maize-growing districts, and which, in my opinion, is a factor which unconsciously diminishes

the yield of the crop. In only a few instances was there observed any great regularity in the planting of the seed; in one instance in particular a regular "machine-like drop" in the hand-planting stamped the farmer as above many in this respect.

Under the past seasonal conditions, the practice of "drilling out" planting furrows with a mouldboard plough and leaving them open to receive moisture, then planting and covering straight after rain, was successfully employed by one good competitor. In fact this practice might directly challenge, for superiority, the ploughing of the whole land in any season which is dry in the early part.

On account of the necessity for ploughing in maize on heavy land in this district, there appears to be a tendency to follow the practice on the lighter chocolate or red soils, whereas better results could be secured by the use of the planting machinery which is precluded to a large extent on the heavy black soil. At the same time, even on the black soil, farmers realise the improvement in machine sowing where it can be adopted, and the use of a locally manufactured planting attachment (the "Cosh" planter) for the multiple plough is growing.

The past season was a difficult one to get a good germination for maize, but such seasons occur with some frequency in the Inverell district, and methods for improving the germination and the regularity of the stand are due for greater consideration.

After-cultivation and Weed Growth.—It is an axiom not perhaps to be learnt, but to be realised better, that the primary object of cultivation in the maize crop is to keep down the weeds, and that this should be done at almost any cost. Maize can do with all the moisture it can possibly get at its most active, nearly full-grown stage, and while the season under review promised to give the maize crops all the moisture they required at this stage, in too many instances weeds were allowed to compete with the crop when the dry spell broke. Admittedly it was somewhat more difficult than usual to deal with these weeds coming when the maize was fairly well grown, but the fact that some of the competitors, even on the heavy black soil, had fields almost completely devoid of weeds at the end of February showed that they realised, apart from competition results, the importance of the work necessary to achieve this condition. In judging the crops under this head, it was considered necessary to be somewhat severe on some competitors, for the purpose of giving just and full credit to those who had gone to much trouble in ridding the crop of weeds—in other words, of rewarding good farming, which is, after all, one object of these competitions. I must say, before passing further, that I was agreeably surprised in view of the season and its attendant difficulties, at the extreme cleanness of the crops of some of the competitors.

In judging the crops for cleanness also, due regard was paid to the stage of growth of the weeds in the crop and their effect on its growth, and also on the kind of weeds, some being regarded as more injurious to the present crop, and, if seeding, more harmful to subsequent crops on the land than

others. For instance, no quarter was given to the burr or thistle family, nor to the amaranth tribe (Prince of Wales feather and redlegs). Some farmers contend that weeds that stock will eat are not so bad. That contention may be just, but it cannot serve to justify allowing a maize crop to become foul with such weeds. Couch grass is one of the best stock feeds, but one of the worst weeds in maize. It only requires a slight infestation of this grass in the crop to give the plants a sickly appearance, and to markedly affect the yield.

Some extra measures to prevent the development of weeds in the thinly germinated patches in the field, which were somewhat common last season, need consideration. In many cases, while the field was generally fairly clean where the stand was good, the thin patches were serving as a breeding ground for the dispersal of many bad weeds.

Condition of Crops.—Under this head the crops were judged for germination and stand, evenness of growth and maturity, and general condition and appearance. Under the last heading, the most noticeable features which caused loss of points were a poor fertilisation or setting of the grain, due to the hot, dry weather experienced during the tasselling period (and possibly accentuated by the presence of Rutherglen bug in some crops at that stage), and a "blasting" effect on portion of some crops, or, as was sometimes observed, in many plants through the field. The last may be due to the same cause, probably assisted by the presence of an obscure fungus (*Fusarium*) disease, which appears to be universal through the maize crops of the State, weakening the constitution of scattered plants and being more noticeable when the general crop suffers from being grown under too dry or too wet or too cold (in short, unfavourable) conditions. This unhealthiness of the stalk manifests itself in a premature ripening or withering of the top leaves of the plant, before even the bottom leaves commence to die off, as is the natural procedure or phenomenon in the ripening of the plant. Of course, a maize crop may lose in condition and appearance on account of the premature ripening of the bottom leaves, which often takes place in dry seasons, or if the crop is crowded with weeds. In some crops also, there was observed an unhealthy reddish colour of the leaves and stalks, which generally indicated barrenness or nubbin cobs, unless such stalks had plenty of space to acquire sufficient moisture and plant-food.

The removal of suckers from the maize crop or the topping of the plants above the cobs was practised by some competitors with the object of increasing the yield. More care needs to be exercised in coming to these conclusions, as it is not thought that either practice will work the desired effect; most often, in fact, it quite appreciably lowers the yield of the crop.

Disease and Insect Pests.—The Inverell district is remarkably free from insect pests on the maize crop during its growth, only scattered ear-worms being noticed in the crops examined this season. Only a few of the crops showed any marked effect of the *Fusarium* disease mentioned above, and for

the guidance of farmers generally it should be stated that from present indications it seems that the trouble can be materially lessoned by careful attention to seed selection, favouring a type with a tendency to harder and smoother grain, and avoiding (especially in the extreme) the softer, starchy, rough-dented type, which is often selected because of its good depth of grain, but which seems more prone to throw plants with the above diseased or unhealthy condition.

Varieties and Source of Seed.—In this competition it was a significant fact that among seventeen competitors or crops entered, there were no less than eleven varieties of maize, and it is probably safe to say that the number of varieties of maize grown round the Inverell district is twenty or more. Now, it cannot be that all these varieties are of equal yielding capacity under the same conditions, nor can it be that there are twenty different soil and climatic conditions in the Inverell district which demand that twenty different varieties should be grown. In short, some farmers are growing varieties of maize which could well be replaced by better yielding varieties. If a variety can be found to out-yield another by 5 bushels per acre (not an uncommon happening), a farmer growing 60 acres of maize of the poorer variety is robbing his pocket of £60 per annum which could be well utilised by his family, even if he has not the ambition to want it himself.

The Seed Maize Contest which is already being conducted by the Inverell Pastoral and Agricultural Society may be expected, if continued for some years, to do all that is necessary in demonstrating which are the most profitable varieties of maize for the Inverell district. The competition at present under review does not mean in any way that the winning crop indicates the best variety of maize to grow in the Inverell district. As a matter of fact, the variety in the winning crop is a somewhat dangerous variety in unpractised hands. Fitzroy is a late coastal variety of maize which has been grown and carefully selected by Mr. Thomas for the past twelve years, until he has probably got a strain which is earlier in maturity and shorter in growth than the original coastal variety (known then under the name of Improved Yellow Dent). In any case it is considered that this variety still requires somewhat favourable conditions, such as Mr. Thomas with his good soil and his good cultivation methods is able to give it. The present season, also, has suited the late-maturing varieties better than the early-maturing kinds of maize.

To show how dangerous this variety is in the hands of those who do not weigh matters carefully, and who might be tempted to grow it because it it was the variety in the winning crop, the writer had a chance to observe another crop of this variety not entered in the competition, for which seed was obtained from a local agent who procured it from a Sydney seedsman, who in turn would get it direct from a North Coast grower. This crop was a miserable disappointment, although sown at the same time and on quite as good land and nearly as well cared for as Messrs Thomas Bros The reason for this is the wholly unacclimatised nature of the seed.

It is necessary to draw attention to these facts for the sake of some farmers who may be apt to rush to the conclusion that it was the variety of maize grown which won the competition. There is no intention here to detract from a meretorious win. The selection of the seed has apparently been in strong, capable hands, but this same variety of maize may suffer a good deal under other conditions.

It is not for this competition to indicate any value in the variety, but one matter is due for mention with some regret—and that is the discovery that so few farmers grow and select their own seed maize. What is still more astonishing, though, is the fact that many farmers depend on local seedsmen or agents, some of whom draw their supplies from Sydney. Such competitions as this serve to draw attention to these facts, and it is hoped that as a result of their ventilation the stigma attaching to Inverell farmers in this respect will be speedily removed. Hundreds of pounds sterling must be lost to the district, directly and indirectly, through this practice, and no great progress can be made in the maize-growing industry in the district while it continues.

It is said that the contract husking and shelling machines have been largely responsible for farmers neglecting to select their own seed maize, but this does not absolve the farmer much, if at all, for a small special seed plot causes little extra trouble, and should be the aim and pride of every maize-grower.

Purity of Seed and Trueness to Type.—In allotting the points under this head an examination was first made in the field where this was possible, but it was a condition of the competition that each competitor should bring ten cobs from his crop to the Inverell show, where they would be finally allotted the points for this character.

In view of the above-mentioned fact concerning the varieties and source of seed, it would not be expected that a very high standard of seed of good quality and true to type would be seen generally in the Inverell crops. There were, however, some notable exceptions.

Suggestions for Future Competitions.—It is only after actual experience with a particular scale of points in judging that anything can be said in its favour or otherwise. After using the present scale, I should like to say that for a maize competition arranged in mid-season, as was the present one, when each competitor had to select portion of his field crop already in, it could not be bettered, except in a few minor particulars. For a competition which is arranged before the beginning of the season, and for which some growers might go to extra pains or at least have a definite standard to work to on which the award is made, I would suggest a different scale, which, in my opinion, will be more satisfactory to judge by, will more easily pick out the best crop, and above all will have the highest educational value, in that it should act as a direct incentive for improved effort in the maize-growing industry in the district. Good farming methods are always to be admired and encouraged, and even if farmers go to special trouble in working a special field of 10 acres for such a competition, that trouble and those methods are to be encouraged if they produce the results. By these

means it is probable that some farmers may be induced to take more care or to work along better lines for a larger area of their crop, and the results may also serve to demonstrate to neighbouring farmers the full possibilities of maize-growing. Further, the better results obtained will act as a good advertisement for the locality.

On account of the high educational value of these competitions, if conducted on good lines, and of the better and more direct encouragement to good farming, I would suggest the following scale of points for judging future competitions :—

Germination or stand	10
Evenness and general appearance of crop	10
Cleanness of crop and cultivation methods	25
Freedom from disease and insect pests	10
Purity of seed and trueness to type	15
Apparent yield (3 points for each five bushels). Probably about	30
Total (about)	100

Fallowing in Districts of Ample Rainfall.

The problem exercising the mind of a Muttama wheat-grower was presented to the Department in the following terms :—" Wheat grown on fallow in this locality during the past two seasons has given very poor returns—as low as 6 bushels per acre. On the other hand, wheat grown on land not fallowed has given a fairly high yield—up to 30 bushels per acre. The general opinion now is that fallow for some unknown reason does not suit this district. I would be obliged if you could give me any information on the subject, as I have 140 acres of fallow ready for sowing."

Why the yields from fallowed land in the district referred to should not be so good, if not better, than those from unfallowed land the Chief Inspector of Agriculture confessed, in reply, he could see no reason, without further information, though the low yields might have been due to a number of causes If, for instance, the land had been fallowed and had not been well consolidated during the process, so that the wheat was sown on a loose seed-bed, the returns would be poor. That, however, should not have been the case in a year like the last, as there was ample rain during the growing period to consolidate the soil.

Low yields might also be due to the fallowed land producing rank growth, resulting in lodging and loss of grain. The best results from fallowing were seen in dry seasons and in dry districts. The average annual rainfall in the district (near Cootamundra) was very good, and it was probable that it would not pay to fallow. That has been the experience of the Department and of a number of successful farmers in the Wagga district on the eastern side of the railway, where conditions were somewhat similar to those of the correspondent. It appeared that the best practice was to take off a couple of crops of wheat in succession or of wheat followed by oats, and then to allow the land to go to grass for a year or so before breaking it up again for re-sowing with wheat. This would keep the ground in good condition and free from oats, and at the same time would avoid the disadvantage of having land lying idle, as in the case where a year's fallow was given.

It would hardly be advisable for the correspondent to leave his fallowed land out of crop, as it should give quite satisfactory yields.

Farmers' Experiment Plots.

Hay Trials at Yanco, 1923.

A. N. SHEPHERD, Senior Agricultural Instructor.

The following farmers co-operated with the Department in carrying out trials with wheat and oats for hay during the season 1923:—

W. Edwards, Farm 367, Leeton.
R. Farrar, Farm 796, Gogeldrie.
R. Tiffen, Farm 319, Leeton.
J. Sippel, Farm 138, Leeton.
J. E. Williams, Farm 56, Leeton.

On heavy land, poorly drained or with little fall, great damage was caused to the crops by the exceptionally heavy winter rains. Where irrigation was delayed until the last watering trouble was also experienced, as the land would not dry out to allow of seeding. It was again clearly demonstrated that irrigation should be carried out early in April, as this allows ample time for the land to dry sufficiently to carry the seeding machinery and for the crop to be got in at a favourable period. During the spring very heavy wind storms prevailed and also affected the crops, breaking off the plants, and in the case of much of the oats browning off the flag.

The rainfall registrations at Leeton were as follows:—May, 92 points; June, 533; July, 233; August, 127; September, 151; October, 104; November, 32; total, 1,272 points.

Cultural Details.

Farm 367.—Red clay loam, on which were sown variety trials of wheat and oats. Previous crop oats, fertilised with 70 lb. superphosphate per acre; ploughed immediately after harvest and allowed to remain fallow. Irrigated, springtooth cultivated and harrowed in early April, and harrowed after drilling on 28th April at the rate of 1 bushel of wheat per acre and 1½ bushels of oats, and 70 lb. superphosphate per acre. A very fair germination resulted, but the crop received a set-back due to the wet winter, the Bomen wheat suffering the most. A very good sample of hay was cut on 15th November. The Algerian oats were harvested on 23rd November.

Farm 796.—Oat trial carried out on black soil. Ploughed in April; it was intended to sow in May, but owing to heavy rain the operation could not be carried out until 23rd June, with seed at the rate of 1½ bushels and superphosphate at 70 lb. per acre. Splendid germination was obtained and the crop made good growth. Quondong showed the most growth and was the first to come into ear—during the first week in October. The crop was cut on 22nd November.

Farm 319.—Several varieties of wheat, all of which may be said to be early-maturing, were sown on a red loam, at the rate of 1 bushel of seed and 70 lb. of superphosphate per acre. Previous crop oats, with 70 lb. superphosphate; land ploughed in January, disced in February, harrowed and irrigated in March, and harrowed after being drilled on 23rd April. This crop made very good growth, and was cut for hay on 21st October.

RESULTS of Wheat variety trials.

Variety.	Farm 367.				Farm 319.				Farm 56			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Warden	2	1	3	24	...				1	18	0	6
Zealand	1	16	1	14	...				1	18	1	6
Warren	1	17	0	22	...				1	17	1	2
Bomen	1	11	1	19	...				1	13	3	8
Gresley	...				2	0	3	21	...			
Clarendon	...				1	12	2	9	...			
Improved Steinwedel	...				1	11	1	25	...			
Canberra	...				1	13	2	22	...			
Waratah	...				1	19	2	1	...			
Aussie	...				...				1	18	0	25
Currawa	...				...				1	17	0	7
Wandilla	...				...				1	16	3	8
Marshall's No. 3	...				...				1	16	0	7
Yandilla King	...				...				1	15	1	12

RESULTS of Oats variety trials.

Variety.	Farm 706.				Farm 367.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Myall	2	9	3	19	...			
Quondong	2	7	2	13	...			
Lachlan	2	9	1	1	...			
Yarran	2	6	1	2	...			
Mulga	2	5	0	11	1	10	3	4
Algerian	1	19	2	6	1	17	3	0

FERTILISER trials.

Fertiliser per acre.	Gresley Wheat at Farm 56				Algerian Oats at Farm 138.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 70 lb.	1	4	2	15	1	6	0	14
M7, 90 lb.	1	2	3	23	1	9	0	9
No manure	0	18	3	26	1	2	0	13
M7, 90 lb. (potato land)	1	13	2	26	...			
Superphosphate, 140 lb.	...				1	8	0	23

Farm 138.—A manurial trial with Algerian oats was conducted on this farm on red clay soil. Previous crop Sudan grass, with 56 lb. superphosphate per acre; ploughed in January, graded and cultivated February, irrigated in

April, and cultivated, harrowed, and drilled on 26th April, followed with the harrows, the usual rate of seeding being employed. The yields of this plot was greatly reduced by the heavy winter rains lying on the surface, the land being very flat with practically no fall. Under ordinary irrigation conditions satisfactory results have been obtained on similar lands, where only light waterings are required.

Farm 56.—Two experiments were carried out on this farm—one a variety trial and the other a fertiliser trial with wheat. Grey clay soil; previous crop oats, with 56 lb. superphosphate. Ploughed in January, irrigated end of March, then double-disced; drilled and harrowed on the 10th and 11th April. An additional plot was added to the manurial trial, using the same quantity of M7 mixture; the land used had previously grown potatoes with 2 cwt. superphosphate per acre. The main plot was grown on barley land. This trial was sown on 25th April. As will be seen from the results, that portion sown on the land that had previously grown potatoes gave very much greater yields, which may be attributed to the extra working the land received while cropped to potatoes and to the rotation of crops. As in the cases of the other crops, the yields were reduced by the very wet winter. The crop was cut on 16th and 23rd October.

Of the new varieties tried, Aussie gave good returns: it has the advantage of being early and stools well. Wandilla did very well considering the conditions under which it was grown, the wet weather reducing its yield owing to a couple of low patches of land occurring in the plot.

"The Empire Cotton Growing Review."

The Empire Cotton Growing Review is the official organ of the Empire Cotton Growing Corporation, through the secretary of which the initial issue of the publication reaches us. The function of the Corporation is to advance the movement pioneered by the British Cotton Growing Association, and, with the advantage of direct Government co-operation and support, not only to develop cotton growing in all suitable parts of the Empire, but to carry out research and experimental work. It is as the clearing-house of this intelligence that the *Review* is intended to operate, so that directors of agriculture and others engaged in cotton-growing may be kept in touch with developments elsewhere and be made conversant with such statistics and other information as the Corporation may acquire. Incidentally, it will endeavour to "give both spinners and growers a better knowledge of one another's lives, experiences, requirements, and difficulties."

The scope of the *Review*, therefore, is by no means restricted, and its successful editing (as the opening article points out) will to some extent be dependent upon the expressed tastes of its readers. The character of the first number is naturally somewhat "historical" and tentative, but the matter is interesting, and regular features of a valuable type are promised for later issues The journal, which is a quarterly, is published by Messrs. A. and C. Black, Ltd, London.

WHEATS FROM SOUTH AUSTRALIA.

SIX new "solid straw" varieties of wheat which had been reported as giving good results in some dry districts in South Australia were recently tested at Temora Experiment Farm from seed supplied by the South Australian Department. The wheats under trial were Emperor, Felix, Maharajah, President, Rajah, and Sultan, all of which are three-quarter blood King's Early, and have been evolved for the purpose of replacing the King's Early varieties (which are bearded wheats) by beardless varieties retaining the excellent hay qualities of King's Early.

In the following table are shown the hay and grain yields of the varieties, together with their pedigrees; also the yields of King's White and Caliph (a beardless half-bred King's Early variety), which were grown under similar conditions for comparative purposes:—

Variety.	Pedigree	Hay yield.		Grain yield.	
		tons	cwt.	bus.	lb.
President ...	Anvil (King's White x Jonathan) x King's Red ..	3	2	24	30
Rajah ..	King's Red x Anvil (King's White x Jonathan) ..	3	1	23	27
Sultan... .	King's White x Caliph (Marshall's No. 3 x King's White).	2	19½	25	0
Emperor ..	Beardless King (selection from King's Early) x King's Red.	2	18	23	34
Felix ..	Anvil (King's White x Jonathan) x King's White ..	2	17	24	0
Maharajah..	King's Red x Anvil (King's White x Jonathan) ...	2	16	22	1
Caliph ...	Marshall's No. 3 x King's White	2	12	25	50
King's White	Selection from King's Early	2	11½	19	52

The results serve to indicate that the elimination of the beard (to which objection is raised by some farmers) has not been attended by any depreciation of yield or quality of hay, and the only characteristic which appears to have suffered is earliness of maturity. In this trial Felix was the only variety which matured as early as King's White, the balance being a few days later.

The following grain yields of local varieties are also comparable with those of the South Australian varieties in the table:—

	bus.	lb.		bus.	lb.
Federation	28	8	Hard Federation ...	23	23
Yandilla King ...	27	45	Clarendon	21	6
Waratah	24	0	Florence	18	40

As the South Australian varieties are early maturers, the fairest comparison would be with the four last mentioned varieties. Comparable hay yields of the above varieties—and it is as hay producers that the South Australian varieties are chiefly valuable—are not available.

Further trials will be carried out with these wheats, but, as they have no particular merits under New South Wales conditions, they are not recommended to local farmers.—H. G. STENING, Manager, Temora Experiment Farm.

CITRUS SCALE.

IF the trees are strong and healthy April is not too late to get rid of red, brown, olive, and wax scales, and of white louse by fumigation, but it should always be borne in mind that January and February are the best months for this operation, as time is then allowed for the dead scale to fall off, and leave the fruit clean for the market.—W. J. ALLEN.

Lamb Marking.

F. B. HINTON, Sheep and Wool Expert.

LAMB-MARKING embraces ear-marking and tailing, together with the castration of the male lambs. The three operations are usually carried out at the same period, generally when the lambs are between 3 and 6 weeks old. There is considerable diversity of opinion among sheep-breeders as to the most suitable age for performing these operations, some claiming that at a fortnight old there is least risk to the animal through loss of blood, while others prefer a later age, even up to 3 months, claiming that the lamb has then grown sufficiently to withstand the check. In cold districts and severe seasons, the additional warmth and protection afforded the hindquarters is a reasonable argument for delay, but under average conditions it is generally conceded that from 3 to 6 weeks is the safest age for tailing and castration. Where the lambing season is protracted there will naturally be considerable difference between the ages of the lambs dropped first and those dropped last, and it may be necessary to mark the drop in two portions with an interval of a month between.

The choice of the site for the operation is important. It should be perfectly dry and well away from dust and dirt so as to minimise the risk of losses from lockjaw and blood-poisoning, and if the flock is not too large it is best to use temporary yards made of movable hurdles or wire-netting and stakes, in a fresh paddock each year. With large flocks this is perhaps impracticable, and the following treatment of the yards is recommended:—Remove the surface soil of the yards to a depth of about 6 inches, and place it in a heap, where it should be thoroughly mixed with quick lime; then saturate the fresh surface exposed with a strong solution of non-poisonous sheep dip.

The sheep should be mustered some time before, and the lambs allowed to settle down before the operations commence. There should be no rushing about, and dogs should be used as little as possible, as deaths from hemorrhage are very common when lambs are marked in an excited and overheated condition. Both sexes may be treated at the same time, and a useful check will be obtained of the numbers and sexes marked if the tails of the male and female lambs are thrown into separate heaps.

The Knife.

The knife used for docking and tailing calls for special attention. The most suitable type has the blade and handle all in one piece, but in any case it should be as plain and as sharp as possible, since germs may be harboured in joints or corners and even in cracks in the blade or in slight irregularities in the cutting edge. Prior to the commencement of the operations the knife should be boiled, and it should be carried to the yards in the liquid in which it was boiled. Throughout the marking the knife should be dipped as frequently as possible in a carbolic solution or other

disinfectant; and whenever it is out of the operator's hand it should be allowed to remain in the disinfectant. This point is stressed, as it is essential that every means of preventing the germs of disease from gaining entrance into the fresh cuts made in the scrotum and tail be adopted, and although many farmers who have taken no precautions have not suffered losses, there is always the grave risk of the knife becoming infected and transmitting germs to every animal operated on.

The order in which the operations are best carried out in the case of male lambs is castration, ear-marking, and tailing, and in the case of ewe lambs, ear-marking and then tailing. In both cases the lamb is held securely with its back firmly placed against the body of the holder and its rump upon a suitable structure (usually the rail of a fence) which should be at a convenient height for the operator.

Castration.

There are two principal methods of opening up the scrotum—(1) cutting off the lower end of the scrotum, and (2) slitting the scrotum from back to front and pressing the testicles through. The first method is the one most commonly used, the testicles being drawn out by the teeth. When done promptly and steadily, without snatching, this is the quickest and simplest method. Where the operator's teeth are not strong enough for this method to be adopted, small instruments can be used. They are now obtainable at a low cost. As to the two methods of cutting the scrotum, there are points in favour of each. It is claimed that where the lower end of the scrotum is cut off better drainage of the wound is effected, while those who prefer the second method claim that when the wether is fattened for market, the cod fills with fat and so gives the animal a better appearance.

Where it is found impossible to remove the two testicles, owing to one not being sufficiently down to be grasped by the operator, about 2 inches only of the tail should be removed. This enables the owner to pick out, at a later date, the imperfectly castrated animals, which should be fattened and killed as soon as possible; otherwise they become a nuisance among the breeding stock.

Ear-marking.

The owner's ear-mark should be marked on the near or left ear of male sheep, and on the off or right ear of female sheep. Distinctive ear-marks, such as those denoting the age and class of sheep, should be marked on the off or right ear of male sheep and on the near or left ear of female sheep. These operations are always performed with pliers denoting the required mark. In the case of stud animals or those about which some special reference is required to be recorded, ear-tagging or tattooing is generally employed. When placing ear-tags in the unregistered ear of lambs, care should be taken to place the tag as close to the base of the ear as possible, and that the main ligaments of the ear are not destroyed. This method of ear-marking, however, is generally performed at a later stage than the general lamb-marking.

Tailing.

There are two methods of de-tailing, (1) by use of the knife and (2) by the searing iron. The principal claim for the latter method is that searing seals and cauterises the wound, and thus prevents the invasion of tetanus and other bacilli. For the knife it may be said that the method is rapid, clean, and effective.

During 1908 and 1910 tests were conducted at different experiment farms with the two methods, and a large amount of data was collected. Briefly, the results indicated that the seared tails took much longer to heal, the stumps showing a running sore that ate into the bone in the remainder of the tail, while the knifed lambs exhibited little inflammation and their tails had all healed within three weeks of the operation. The seared tails in many cases were still discharging for upwards of six weeks. Whichever method is employed, success depends upon the efficiency and care displayed by those in charge of the operation, and if lambs are treated in dirty and dusty yards or under damp or cold conditions, or if sufficient care is not paid to the cleanliness of the knife, it is not reasonable to expect the best results.

The point at which the tail should be severed depends somewhat on the sex of the lamb. It will be found that to cut the tails of ewe lambs at the second joint from the root is an advantage at both mating and lambing times. With male lambs an extra joint may be left on, as this adds considerably to the appearance of the matured animal. Should the severed blood vessels bleed freely, a ligature should be at once applied and removed later when the blood clots.

To remove the tail the operator grasps the tail in his left hand with the thumb on top, and presses the skin back towards the root. At the same time he feels for the required joint and then, using the knife with the other hand, places the blade just in front of the left hand. Often the knife is used as a means of assisting in locating the exact point at which to cut. By slight pressure of the blade the outer skin can be worked back to the desired position and de-tailing effected by steadily cutting through the joint at the point desired. Slashing should be avoided; with a little care and practice the operator will have no difficulty in cutting through the joint instead of endeavouring to hack through the tail vertebrae. Pushing back the skin before cutting improves the appearance of the stump after healing, as the skin covers the wound to a large extent instead of allowing the bone to protrude.

Upon completion of the castration and tailing operations the wounds should be smeared with Stockholm tar, or dressed with carbolised oil (one part of carbolic acid to twelve parts of oil), before the lamb is released by the operator. This is most important. Should any mortality occur as a result of lamb-marking, the carcases should be destroyed immediately by burning, for if allowed to remain the earth becomes contaminated by absorption of the micro-organism and fresh centres of infection are formed.

Breeders of early lambs often argue that, owing to the severity of the operation of castration and the consequent check the young lambs receive,

male lambs intended for early sale should not be castrated, but experiments have shown that castration has little or no effect, and that wethers compare well with the ewe lambs when the operations are conducted on lambs one month old.

When marking lambs in temporary yards or in a corner of a paddock, as is often done, care must be taken that the ewes are not allowed to spread too far in the paddock before the lambs are released. Although it is inadvisable to keep the ewes and marked lambs in a yard for any length of time after marking, a little shepherding of the flock in the paddock will repay the owner by ensuring that the lamb obtains a drink of milk as soon as possible after the operation. Very often it is found that a number of lambs which are possibly more seriously affected by the operation will hang about the gates of the yard, and if the ewes are not kept handy for at least a little while these lambs will probably become isolated and lost.

A little extra care in the matter of cleanliness and handling of the animals throughout the operation may save serious losses.

Price of Copper Carbonate for Treating Seed Wheat.

"Considerable discussion arose as to why copper carbonate could be sold in America at 20 cents per pound, as mentioned in the *Agricultural Gazette*, while the price was much higher in Australia." So wrote the Hon. Secretary of Myall Creek branch of the Agricultural Bureau recently.

The branch was informed that the copper carbonate which is quoted at 20 cents per pound in America contains only about 17 per cent. of copper, whereas the copper carbonate sold locally contains about 60 per cent. Until further experiments have been conducted the Department is not prepared to recommend the use of the cheap copper carbonate sold in America. A proprietary mixture of copper carbonate, which contains about 50 per cent. of copper, is now being placed on the market by a Sydney firm at 2s. 9d. per lb. This preparation is quite satisfactory, and is being used by the Department for the treatment of seed wheat.—A. H. E. McDonald, Chief Inspector of Agriculture.

Early Tomatoes at Hawkesbury Agricultural College.

The prices received for tomatoes raised and placed upon the market before the bulk crops come in more than justify the expenditure and labour involved in the special treatment required. Excellent returns have been obtained for a number of years at Hawkesbury Agricultural College. From a ¼-acre plot of Spark's Earliana this year 357 half-cases were forwarded to the market, and realised £182 17s. 10d. (or an average of 10s. 3d. per half-case), and 187 half-cases were supplied to the College quarters for £70 16s. 10d. (or an average of 7s. 7d. per half-case), while 1,080 lb. of pulp was manufactured, which, at 4d. per lb., was worth £18. The total production from the quarter-acre for the season was thus £271 14s. 8d.—E. A. Southee, Principal.

The Lucerne Lands of Tamworth and Mudgee.

J. E. O'GRADY, Nemingha.*

It is a well-known fact that the lucerne hay produced in the Mudgee district has a reputation on the Sydney market which excels that of the produce of any other district which supplies any considerable quantities. It is true that occasionally a truck from Tamworth will bring a higher price, whilst the Belubula flats at Canowindra are now becoming known to Sydney buyers; but to the Sussex-street dealer, to the suburban produce merchant, and to the carrier or cabby who wants a small bale, or half a small bale, to give his tired horse a welcome change of feed on a Saturday night, quality in lucerne hay means a Mudgee hay and nothing else. Our Sydney agents tell us to put up all our fine leafy green hay in small bales, "like the Mudgee men," to obtain the highest price for it.

One of the main essentials in first-class lucerne hay is a high percentage of leaf. There is much more nutriment in the leaf than in the stem. It is in this respect that Mudgee has gained such a reputation. Our Tamworth hay, though green and succulent, is usually rather coarse, and in wet seasons often very coarse, the stems sometimes being as thick as lead pencils. On the other hand, in dry times our lands often produce a fine leafy hay equal to Mudgee's best, and in some parts of the district the hay is nearly always fine. The semi-alluvial soils of Loomberah, away from the river, produce a hay equal to anything to be seen at Mudgee, but this hay seldom finds its way to market, being produced in small quantities for home use. The average Tamworth hay which is sent to Sydney is coarser than that of Mudgee, as any man can verify for himself by spending a morning in Alexandria yards. Tamworth growers are going in more and more for chaff, and they are wise. Only the finest of our cuts will meet the special demand which Mudgee supplies. Hay which is on the coarse side will sell in large bales to metropolitan dairymen, and, of course, in a drought it will bring a high price, but, as a general rule, it is better chaffed.

During a recent visit to Mudgee in company with our worthy president, I endeavoured to ascertain the reason why that district produces such fine hay. I was introduced to one of the largest and most progressive lucerne growers at Mt. Frome, who suggested several possible causes. First, he pointed to his press, which was an ordinary Clyde bundler such as we all know. Next he praised the Mudgee pressers, particularly the stackmen. This not being convincing, he said: "Perhaps it's the way you make your hay." Again

* Text of a paper read before the Calala Branch of the Agricultural Bureau.

I demurred, saying that there are many good haymakers at Tamworth and that as Tamworth grows many times the quantity produced at Mudgee, there must surely be men there as competent. The quantity of seed sown per acre was his next query, and finding this about the same, he gave it up and began to show me his flat.

The two districts, Tamworth and Mudgee, have very nearly the same rainfall. Both are west of the Great Divide, and both are subject to droughts and floods. But the resemblance ends there. Mudgee is a colder district than Tamworth by about 5 degrees on the average. Frosts begin a month earlier and end a month later. This fact alone would tend to make the hay more leafy, as in cold districts all plants endeavour to produce a large proportion of leaf, in order that the transpiration of moisture which is essential to plant growth, may proceed through a large leaf surface. If you go into the hot, western plains of this State you will find that the leafy eucalypts of the coast and tablelands are replaced by such trees as wilga, mulga, and mallee, whose leaves are mere narrow bands. Lucerne is particularly susceptible to such climatic influences. Nevertheless, the difference in temperature at Mudgee and Tamworth is not great enough to have any marked effect upon the quality of the hay.

It is in the soil that the true explanation appears to lie. The Mudgee lucerne flats, extending along the banks of the Cudgegong River, are composed of a light sandy loam, of a greyish colour, with dark bands of decomposed vegetable matter to be seen in the river banks. It is not a rich soil—Tamworth men would even call it a poor soil. It is altogether different from the dark chocolate loams and clays found along the Peel and its tributaries. There are alluvials somewhat like it on the Cockburn and on Goonoo Goonoo Creek, but they are richer soils.

The cause of the differences in alluvial soils must be sought in the geology of the country drained by the streams. About Tamworth the parent rock is mainly basalt, and the principal rocks to be found are either basalt itself, or mudstones and limestones which are of basaltic origin. It is a well-known fact throughout the world that basalt in decomposing forms the richest of all soils, and therein lies the glory of Tamworth as an agricultural district. There is no district in Australia which has a larger proportion of rich soil than our own.

It does not follow, however, that rich basaltic soils are always fertile, or that the washings of basalt hills will always form an alluvial soil suitable for lucerne. The mechanical condition of the soil produced must be considered, and this is often the most important factor of all. Basalt decomposing *in situ* generally forms a dark-coloured heavy soil, difficult to work, but very fertile when properly tilled. When, however, the decomposed basalt is carried away by water and deposited by floods on the banks of rivers a very great variation in the resulting alluvial is found. The parent rock is composed of many parts, some of which dissolve more readily than others

and may be carried off more easily. Other constituents are of a hard nature, and can only be moved in the form of coarse sand by large bodies of quickly moving water. Thus we get from basalt, as the parent rock, black alluvial plains, rich in carbonate of lime, very sticky when wet, and cracking badly when dry. Again we get from the same source heavy chocolate clays, which dry out to the hardness of stone and crack so deeply that a pitchfork handle can be buried in the fissures. And again, the decomposing basalt will yield an alluvial with a fair proportion of sand, but rich in lime and other plant-food, friable and deep, resembling brown sugar. This is the real Tamworth lucerne soil, and if it is too rich to produce the fine-stemmed, leafy hay of Mudgee, it certainly makes up for the defect in quality by producing a much larger quantity in the season. Mudgee growers appear to regard 3½ to 4 tons of hay per acre as a good yield for the summer. Many good Tamworth farms produce twice as much.

The Cockburn River, a tributary of the Peel draining the New England granite country, brings down quantities of poorer sandy alluvial. This when mixed with the basalt washings of the Peel, has the effect of making the soil more open in texture, so that the lucerne roots can penetrate it easily. These mixed alluvials are very fertile, because what the granite wash lacks in plant-food is more than compensated by its mechanical effect in making the soil friable. Along the Cockburn itself the granite wash is largely mixed with clayey soil from other tributaries: where this is not so, the soil is very poor and sometimes pure sand.

Coming now to the Mudgee district we find that there is very little basalt in the watershed of the Cudgegong. There are patches of basaltic outcrop, but the parent rock is granite. Limestones and slates are found, these being apparently altered forms of granite mixed with a little basalt. The alluvials formed from such rocks are not to be compared in richness with the alluvials of Tamworth. They will grow lucerne because they are very friable and rich in lime, which is one of the most necessary constituents of a lucerne soil, but they are not rich enough to produce heavy cuts, even where the water is at the right depth below the surface to provide sub-irrigation. Therein lies the probable reason why Mudgee lucerne hay is finer in quality but smaller in quantity than that of Tamworth.

Arising from our little discussion we may consider one or two points of interest to ourselves. First of all we have seen that our lucerne flats are very rich. Will they ever wear out? It is known that lucerne has the power, through organisms on its roots, to draw nitrogen from the air, so that it actually enriches the soil in this element of plant-food. But it uses up large quantities of lime, potash, and phosphoric acid, and unless these are replaced, the point must in time be reached when even our richest alluvials will fail to produce payable crops. There are paddocks near Tamworth which were once famous for their splendid yields, but which will not grow lucerne profitably to-day. And it is not a question of underground water.

because good irrigation supplies are still obtained at shallow depths. Such lands are never flooded, and no silt deposits are left to replace the plant-food removed by the lucerne.

For example, every ton of lucerne hay actually contains between 3 and 4 per cent. of pure lime. This comes from the soil, not from the air or the rain, and when that lime is exhausted the land will grow no more lucerne. Every farmer should remember that, while banking off flood waters makes a lucerne paddock easier to work, it most assuredly shortens the life of the paddock.

Those who have been patient enough to follow me thus far will understand why about Tamworth we find so many different kinds of soil close to each other. The country is undulating, and water at different speeds and of different depths carries away different proportions of the materials which compose the basalt and its derivative rocks, thus forming different soils.

Many of our alluvials, particularly on the Peel itself, are almost pure clays, and though very rich indeed, the lucerne roots cannot penetrate them to any great depth, so that in dry times little or no hay is produced What is the best thing to do with such soils ? After a flood they grow immense crops, and if water is available it pays to irrigate them in dry seasons. It will also be found that they can be irrigated with less water than the sandy soils, in which the water soaks too deeply to travel. Moreover, on these clayey alluvials the plant of lucerne should not be kept too many years, but the paddock should be broken up deeply and resown. The loosening up of the soil will enable the land to retain moisture better and grow payable crops for, say, five or seven years

Treatment of "Seedy Toe" in Horses.

Describing a horse apparently suffering from "seedy toe," the trouble showing in a swollen condition of the bone above the hoof, and a hole extending upwards from the sole, in the hoof itself, a farmer stated that he had had the shoes of the animal removed and had scraped the softish parts from the hole referred to, but there were still evidences of lameness. What was the procedure ?

The writer was informed that if the condition was due to the disease known as "seedy toe," as it appeared to be, the treatment that he had adopted should prove satisfactory. The failure to obtain the required result was probably due to the fact that the treatment had not been carried far enough. It was essential that the horn of the sole surrounding the area should be thinned down, and that all diseased tissue be removed, even if it necessitated cutting right on to the sensitive structures to do it. There was no occasion to worry if the foot bled a little, so long as care was taken to keep it thoroughly clean

All the diseased tissue having been removed, the cavity should be packed with tow soaked in tar, the dressing being kept in place by putting on a shoe and inserting a piece of tin between the shoe and the hoof. The dressings should be continued daily, and the horse kept off work if possible during the growth of the new horn.—A. L. Ross, Veterinary Officer.

Silage as an Essential to Successful Dairying.

What Tilba Farmers Say and Do.

[Concluded from page 190.]

W. H. BROWN, Editor of Publications.

THE production of the material and its transport to the silo occupied attention last month, and in the natural order of things we should next turn to the filling and packing. Before doing so, however, it is convenient to remark somewhat briefly on the types of silos in use at Tilba. It is not proposed here to detail methods of construction, though in various respects these have been a good deal simplified in local practice, but in a district where every farmer has seemingly realised that successful dairying involves carrying as many cows as is reasonably possible on a given area, and that that can only be done if ample provision is made for the inevitable shortage of fodder in winter and spring, there is sure to be accumulated experience that is of interest and value.

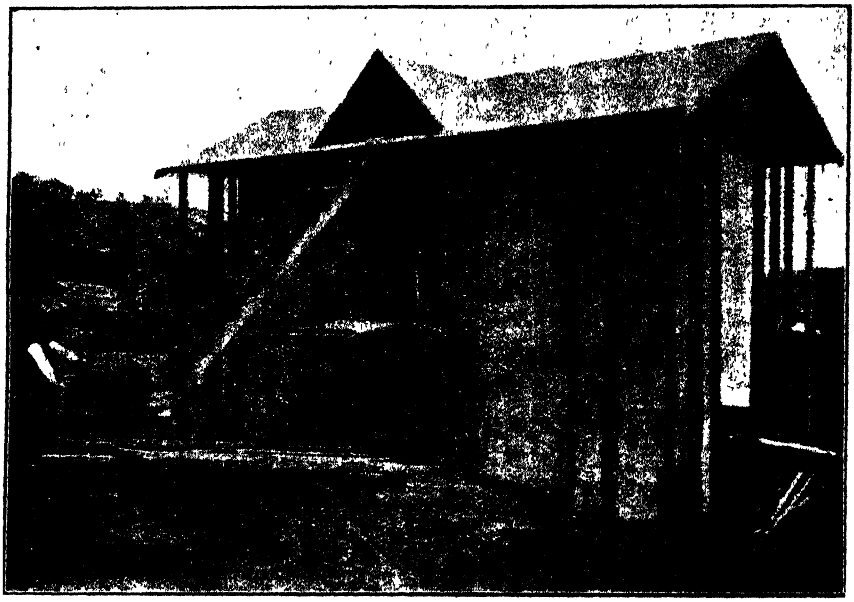
The Silos Favoured.

As elsewhere, probably the first silos were wooden, but in the last twenty years a number of types have been tried, and summing up local experience Mr. H. J. Bate did not hesitate to name the reinforced concrete silo as most satisfactory of all. Next in order and very close up he placed the brick structure; third, he mentioned the wooden stave silo, and last the galvanised iron (non-corrugated, of course). Some years ago several fibrous cement silos were erected in the district, but they have proved quite unsatisfactory and most of them have been replaced by better types, while the owners of those that remain admit their intention to put better in their places as soon as possible.

Of the reinforced concrete type there are quite a number in the district, and fine permanent structures they are, making excellent silage year after year and demanding nothing in the way of maintenance. Two or three pairs of silos of this material were under construction at the time of our visit. The price mentioned in connection with this class of silo was 36s. per ton capacity, though local men believe that with proper methods the cost can be reduced.

One reinforced concrete silo was seen in course of erection on the farm of Mr. S. W. Bate. Its walls were being made 6 inches thick, and it was to be finished with a coat of cement plaster inside and out, and with the roof the total cost was expected to be £180 for a capacity of 100 tons. Local opinion is that 4 inches is a sufficient thickness, which supports the suggestion that 36s. per ton capacity can be reduced.

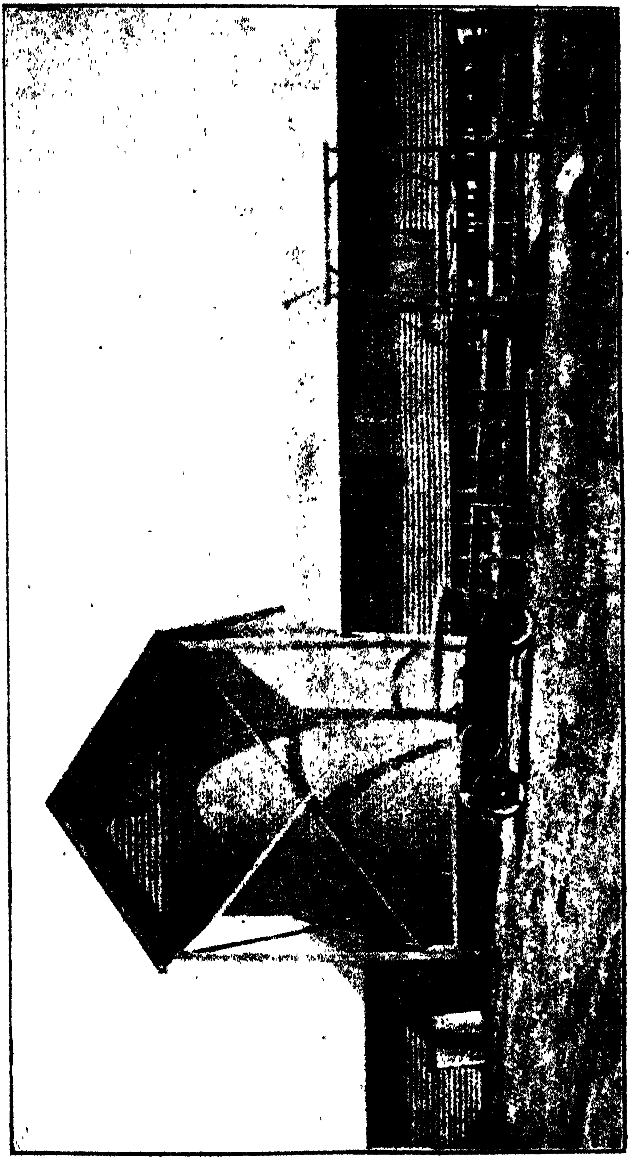
Brick silos cost a little more than reinforced concrete, and in general efficiency and durability there is little to choose between the two types. The large pair of brick silos shown in the illustration on page 265 was erected thirteen years ago at a cost of 17s. 4d. per ton capacity. Their owner, Mr. R. Read, estimates they would cost £2 to-day, but the 14-inch walls are unnecessarily strong, and a 9-inch thickness would serve quite as well. These, and all brick silos, are faced inside with 1 inch of cement.



A Pair of Concrete Silos on a Tilba Farm.
Silage cutter, elevator, and engine in front, and feeding stalls behind on the extreme right of the picture. Note also the combined trolley and slide in the foreground.

Wood silos were preferred at one time as being much cheaper, but the high price of timber in recent years has reduced that advantage until in one case recently an oregon silo actually cost more than a concrete one of a similar size would have done. White ants have proved a serious pest of these silos, and in one or two cases have so reduced the useful life of the structures that the saving in the first instance was largely off-set by this depreciation. Two oregon structures were seen on the farm of Mr. John McFaul, one 25 years old and the other twelve years, but both in excellent condition. They are painted inside each season with wood-preserving oil, and every few years are tarred outside. One of these silcs held its store of fodder for three years and turned it out in the best of condition when it was required.

Experience has shown, too, that the wooden staves must be so set upon the concrete bed that they will not be kept wet continuously at the bottom, whether by rain outside or by moisture from the silage inside. If not so constructed as to keep dry, the timber rots and endangers the whole structure.

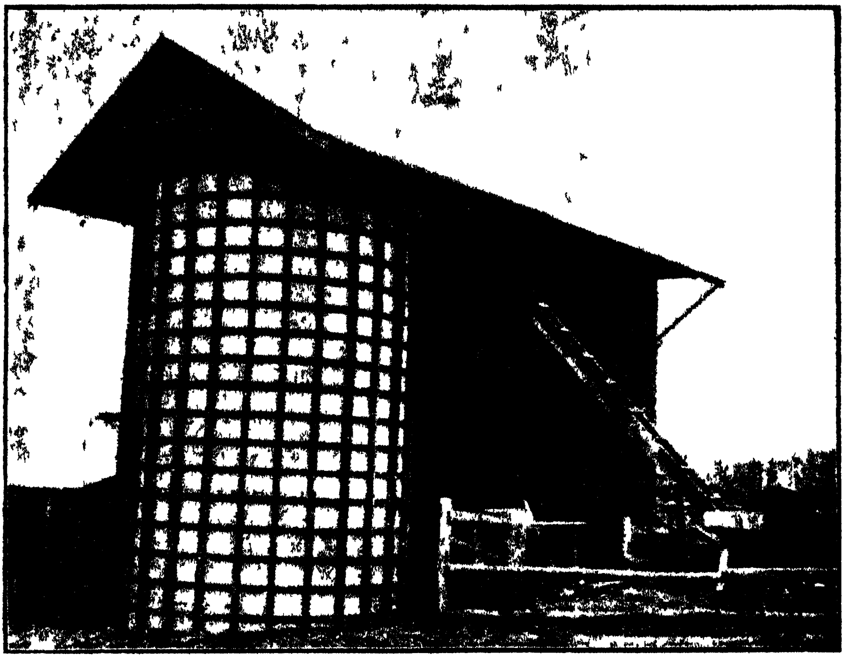


A Pair of Brick Silos at Tilba.

Engine room on the left and feeding stalls with corn crib above on the right. This complete equipment is on Mr. R. Read's farm.]

A "Tin" Silo.

Some interest has been taken lately in galvanised iron silos, and one nearing completion was seen at the farm of Mr. C Hoyer No doubt there is a good deal of prejudice in other districts against this particular class, but the fact that there are two or three at Tilba that are fifteen years old suggests that, providing they receive a fair amount of care, their life is not particularly short. It is essential, of course, that the interior be well covered with tar every year to protect the iron from the strongly corrosive acids of the silage As to the quality of the silage, no complaint was heard, though the rapid heating and cooling that is bound to take place on the sunny side is quite likely to have some effect on the material near the iron



A "Tin" Silo under construction on Mr. C. Hoyer's Farm.

The silo seen had an inside diameter of 14 feet, and a height of 20 feet. Its capacity was therefore 55 to 60 tons, and its rough cost was £70. Mr. Hoyer was good enough to detail his expenditure as approximately £15 for timber, £17 5s. for half a ton of plain galvanised iron of 22 guage, £6 for roofing iron, £7 for bands and sundries, and £25 for labour. For an expenditure of 25s. per ton capacity, the labour of tarring every year, and the possible loss of some silage on the northerly side each year, farmers in most parts of the State could therefore have a structure that would ensure them against shortage of fodder for a sufficient period for all ordinary requirements. But let the reader take warning that no economy in erection will be of the slightest avail if he adopt not measures that will minimise the

work of filling and of feeding out. Without these his silo—cheap or dear, large or small—will inevitably soon rank with others in the State that have fallen into disuse.

Structural Details.

A few further details of this iron silo may be added. The wood frame consisted of 4 x 2 studs of spotted gum hardwood, with 4 x 3 studs at every lap. Instead of being made in sections that would give an approximate circle, it was made a perfect circle by the 3 x 1 battens being sprung into the studs, so that the sheets of iron rested against a level surface.

In all forty-nine sheets of iron, 6 feet by 3 feet, were used, being divided into fourteen upright sections, each consisting of three and a half sheets. The silo could quite easily have been made 24 feet high by making four tiers of iron, but the height in this particular case was limited by the height of the older silo alongside, the intention necessarily being that both should come under the one roof, and be filled by the same elevator.

The studs were the full height of the structure, and the battens 15 feet in length.

The ground plate was rabbeted out an inch to the circle of the studs, and the iron, resting against the rabbeting, was thus in effect let into the ground plate. Tarred felt was inserted between the studs and the iron, with the double object of affording a bed into which the joints of iron would sink, and also of preventing rust where the iron rested upon the wood. The floor of the silo was of concrete, brought up 1 inch below the lower edge of the iron, so that the floor inside was level with the bottom plate outside.

The bottom ends of the studs were dowelled into the bottom plate, instead of mortised, in order that the possibility of the timber rotting by lodgment of water should be reduced.

The structure was bound together with three bands of $\frac{5}{8}$-inch round iron, tightened up with screw ends in an iron coupling.

The roof consisted of an ordinary gable, pitched off the 6 x 3 inch wall plate and overhanging about 22 inches. The gable ends were covered in with weather boards. For such a roof, guttering and proper down pipes are considered essential, as rain water must be led well away from the foundations. A chute, specially designed to be changed easily from one silo to another, completed the equipment.

The doors consisted of two boards, each of 12 x 2 inches, tongue-jointed together, let into 5 x 3 inch studs, which had been rabbeted out so that the doors rested against strong ledges made air-tight with tarred felt. The 5 x 3 studs were strengthened with 5 x 3 trimmers top and bottom, and over and under the trimmers $\frac{3}{4}$ inch bolts held the frame together.

The frame for the doors is one item upon which farmers at Tilba have reached conviction as a result of experience. It was common at one time for the door frame to be on a bevel, but the door swells with the moisture in the silage and becomes so tightly wedged into this class of frame that it requires heavy blows with an axe or mawl to knock it in when the silo

is being emptied. Obviously in such heavy hammering the concrete or brick of the silo may be damaged, and it has therefore become the universal practice to set the doors in a rabbeted frame in which they fit closely with tarred felt as packing, if desired, but out of which they can be easily taken without damage to the structure. The method was illustrated in the *Agricultural Gazette* in October last, page 710.

It must not be imagined that because so much space has been devoted to this silo, the Department recommends galvanised iron as a material. The best and most permanent silos are undoubtedly the reinforced concrete and the brick, but for a man of small means who wants to build inexpensively, with only the help of a carpenter, iron has a recommendation. Providing 22-guage iron is used the silo (tarred yearly) will give a reasonable life, but if iron of lighter weight (such as 24 or 26) is used the result is almost certain to be disappointing. To one other thing such a farmer must be reconciled—year by year the walls must be tarred on the inside, the job being most conveniently done in sections as the silo is emptied; otherwise scaffolding will have to be erected inside at considerable labour.

On all Tilba farms wooden elevators are used to elevate the material from the chaffcutter into the silo. They are found quite satisfactory and inexpensive. Blowers were tried on two or three farms years ago, but were discarded. Engines of various horsepowers are used, of course, but about 4 to 5 h.p. is generally regarded as sufficient. Some farmers are using 3½ h.p. engines, and find they run the plant satisfactorily, but 4 h.p. may be recommended as a convenient and desirable minimum under average conditions.

Careful Filling and Thorough Packing.

The next condition of success with Tilba farmers is that the silo should be properly filled and packed. As the material drops from the elevator it is carefully distributed over the whole area and thoroughly tramped down, in order that it shall be so consolidated as to exclude air. The packing must be done evenly, too, as loose patches mean that air-pockets will be formed, and the silage in those areas will be spoiled. Experienced men keep the material at the outer edges somewhat high and packed tight.

The operation of packing is regarded as of the greatest importance—so important that we were told, "You must put the best man on the farm inside. He is there without observation, and if he cannot be relied upon the material will not be properly packed." Obviously, loss at this stage is twofold—the loss of the material and of all the labour bestowed on it, and a shortage of fodder, which will only become apparent when it is too late to remedy the mistake or replace the spoiled fodder. Some farmers employ two men at spreading and tramping, especially if filling is proceeding rapidly.

Farmers in other districts will not need to be reminded of their own experiences with poor silage, and many will be quite ready to believe that insufficient packing was their trouble. Here are men who make silage every year and who use it extensively, and their testimony is that proper packing is half the business.

Tight packing has another advantage—it means the silo holds a much greater quantity of fodder—an item that may be quite important if at the end of the spring the grass is later than usual in coming away. In this connection the practice of cutting the material into short lengths is also a factor—it means that it packs much closer together. "We get as much as 10 per cent. more into the silo as a result of cutting to half an inch or shorter," Mr. Bate added.

Filling should not go on too rapidly. It tends to create greater heat, and results in an inferior silage. If the material is coming forward fast, and it is necessary for any reason to handle it quickly, it is a great advantage to fill the two silos together, turning the chute from the elevator first into one and then into the other.

Toward the completion of filling, and when the silo is almost full, it is necessary to fill a little in every day for some days in order to compensate for sinking. Even at this stage the tramping must be kept up, and each time fodder is put in a man should be sent up to tramp it down tight. The stuff also shrinks away from the walls, and this should be made up by packing more material in to ensure that the tub shall be thoroughly well filled and the whole mass consolidated throughout. Tramping should be continued for a week after the silo is filled, special attention being paid to the sides.

Some men put a topping of some sort of waste chaff or even earth over the lot when the silo is properly full, but a good many leave it alone, allowing the top few inches of fodder to act as a seal, and quite content to lose that much.

We have now the satisfaction of contemplating a full silo, and our thoughts next turn to the question of feeding the fodder out to the cattle.

To Reduce Labour in Feeding Out.

At this point there enters once more the practical experience of these farmers at Tilba. The labour of feeding fifty or sixty cows twice a day for several months is not tedious to these men. They know silage is an invaluable fodder, and not to be done without, and so they have solved the problem, not by cutting the silo out, but by putting it where labour is going to be reduced to a minimum. They have thus brought the silage and the cattle into the closest possible contact with one another.

As hinted last month, the feeding stalls and the silo adjoin one another, even on the smallest farm, so that in any case there is no carrying, while on the better equipped farms the stalls with the feeding boxes are arranged in double rows, the animals facing inwards to a central passage, along which runs a tram line consisting of a pair of wooden rails for the four-wheeled truck or barrow that carries the fodder to the stalls. The silage is thus filled straight from the silo into the truck, and is run along the passage, the feed boxes on each side being filled with a positive minimum of work.

The fine plant of Mr. R. Read, which is illustrated on page 265, may be mentioned as almost a model of its kind. With a large herd, two brick silos capable of holding 350 tons of fodder, and forty stalls, feeding night and morning is nevertheless a simple matter. The illustration shows the engine-room on the left, and there the chaffcutter and elevator are operated when the silos are being filled. In the centre are the twin silos (30 x 20 feet each, 14 inch walls, with the doors facing one another), while on the right are the feeding stalls on brick floor and foundation, and a well-constructed corn crib above. The whole equipment is thoroughly up-to-date in every respect, and furnishes an excellent indication as to how things should be done to earn maximum profits.

Experience has shown that the stalls should be as narrow as possible; the cows are then unable to do themselves any harm by turning around or to interfere with their neighbours. Each cow is thus compelled to attend to the business in hand—that of eating the meal put before her—and to get out of the stall the sooner. Where the number of stalls is limited this is important, as it means that other cows the sooner get their turn. The stalls are constructed with about 2 feet 4 inches from centre to centre, so that each cow has only about 2 feet clear.

The great majority of farmers at Tilba have separate structures for milking and for feeding, but one or two there are who prefer to feed their cows in the milking bails. In one such case, we found the bails built close alongside the silos, the fodder being loaded in the usual way into a truck which ran on a tram line along the headstalls where were the feeding boxes. The method is to fill the boxes before milking and then to admit the cows. This farmer considered the cows gave their milk quicker if feeding contentedly the while—certainly, he said, more so than if they were anxious to get away to the feeding stalls. It took a few more milking stalls, no doubt, but it seemed to him to give the better results.

The system that has the practical support of the majority, however, is the one first mentioned, and on practically every farm the milking bails were some little distance from the feeding stalls and the silo.

Improving the Ration.

Though silage is of such paramount importance in present-day dairying, being both palatable and fattening, it has been found that the addition of some concentrate with a good protein content, such as bran or pollard, greatly increases the milk flow. Those farmers who are fortunate enough to be able to grow lucerne will find it a most valuable addition, by reason of its high protein content.

But after all, silage, if well made from a well-grown crop, requires little to be added to make it a thoroughly satisfactory ration.

One more item of advice we gathered from this remarkably instructive little district of Tilba. In taking silage out each day, a layer must be taken from the whole surface. No doubt it sometimes looks ever so much simpler to take the day's portion from one spot, but the inevitable result is that

surrounding silage depreciates, becoming mildewy, unpalatable, and even injurious to the cows. If the daily quantity is taken from the whole area, none of the fodder is long enough exposed to deteriorate before it is eaten by the animals.

What it all Costs.

"And what is the cost of all this per ton?" the strictly commercial farmer will ask. Mr. Bate's reply, in anticipation, was that conservation of fodder under such conditions was a different thing from pit silage in wheat districts, where one sometimes hears of 5s. a ton as covering everything. But after all, considering the work done, and the quality of the fodder supplied to the cattle, the Tilba article is not prohibitive. It is generally reckoned by farmers there that silage in the silo costs about 10s. to 11s. per ton. There are some that make it up to 15s. per ton, but even at that figure the fodder is cheap indeed.

And what it is worth when fed to the stock, who shall say? In days when one South Coast farmer saved his herd of fifty or sixty cows at a cost of £400, and another confessed that it cost him £7 per head to keep his herd alive—when, moreover, they were considered fortunate to have their cows at all at the finish—what value shall be put on a system that kept the milking almost up to normal, that hardly lost a single animal on some thirty-three farms, and that after the drought turned the cows out again on recovering pastures in a condition that enabled an early return to ordinary profits? We leave the calculation to some of those who a few months ago lamented their shortages of conserved fodder, and who to-day are already in danger of forgetting the lessons an unparalleled coastal drought should have taught.

Our Acknowledgments.

In closing, it is fitting that we should tender our thanks to Mr. H. J. Bate for the large amount of valuable assistance he so generously afforded for the collection of the information presented in this article. We believe his greatest satisfaction would be in seeing those methods, which in his own district have grown so unconsciously into a highly successful system of farming, become also the methods of farmers in many other parts of the State.

Grasshoppers and Bunchy Top.

"I am of opinion that bunchy top at this time of the year is caused mostly by grasshoppers depositing their excreta at the base of the leaves, where it is dissolved by rain, penetrating a short distance down the stem, and thus poisoning the plant."

To such a proposal from the Tweed River district the Biologist replied that the Department has no evidence that grasshoppers are connected with bunchy top. The disease occurs where few, if any, grasshoppers are present, and, in any case, plants in general are not susceptible to poisoning by excreta dissolved in water.

A Pasture Improvement Competition.

A PASTURE improvement competition was conducted this year by the Berrima District Agricultural Society in the Moss Vale district. The awards are shown in the accompanying table.

Competition.	Variety and quality of grasses.	Presence of clovers and other leguminous plants.	Freedom from useless plants.	Freedom from disease.	Manuring and general improvement.	General care and judicious stocking.	Total.
Maximum points	30	15	25	10	10	10	100
T. B. Brown, "Broughton Park," Moss Vale, Plot No. 1	24	10	20	9	9	9	81
F. J. A. Lytton Hitchens, "The Hut," Moss Vale	22	8	20	8	9	9	76
H. S. Holt, "The Chase," Moss Vale	20	7	19	8	9	8	71
T. B. Brown, "Broughton Park," Moss Vale, Plot No. 2	19	7	18	8	9	8	69

The winning plot contained cocksfoot, rye grass, cow grass, clover, and white clover, and although not showing a great deal of growth, the plants covered the ground well, very few bare patches being noticeable. Owing to the dry season, only 458 points of rain having been recorded at Mr. Hitchens' property for the period 1st November to 29th February, the pastures were all very dry, but introduced grasses, wherever planted, showed to better advantage than the majority of the native pasturage.

Cocksfoot (*Dactylis glomerata*) resisted the dry conditions exceedingly well, and in this respect was superior to Perennial Rye (*Lolium perenne*). Rye pastures are practically at a standstill in the Moss Vale district at the present time, whereas cocksfoot areas are producing good quality feed. This fact should be kept in mind by farmers of this district who intend to sow grass areas during the coming season.

Two weeds, cat's-ear or dandelion (*Hypochœris radicata*) and sheep sorrel (*Rumex acetosella*) were fairly plentiful in all plots.—J. N. Whittet, Agrostologist.

When Manuring Fruit-trees.

"I AM putting stable manure on my orchard this year instead of bone and blood. Should it be spread around the trees, say a foot from the trunks to the circumference of the branches, or would it be better to spread it in the ways between the rows of trees"?

In response to the foregoing, it was stated that the manure should be kept away from the trunks of the trees, as if it was allowed to come into close contact with them it might induce collar rot. It should be spread well out into the rows and dug or ploughed under.—W. le Gay Brereton, Assistant Fruit Expert.

Tetanus.

H. G. BELSCHNER, B.V. Sc., Government Veterinary Surgeon

TETANUS is an infectious disease occurring in all animals, but especially the horse. Sheep and goats are more readily susceptible than cattle, but dogs and cats are less so. Man is very susceptible. The disease is characterised by spasms affecting the muscles of the face, neck, body, and limbs, and of all the muscles supplied by the cerebro-spinal nerves.

Causes.

The disease is caused by a bacillus that is often found in the soil, especially in agricultural and garden soil, in manure, and in dust. This germ grows only when air is excluded. For this reason deep wounds, nail pricks, &c., infected by this germ are more dangerous than superficial wounds, because in the former the germ is well removed from the oxygen of the air.

The bacilli elaborate a toxin which reaches the central nervous system, and produces the general tetantic spasms. The germ may gain entrance to any wound, but more especially to those wounds which readily come into contact with the earth on account of their location, or those in which foreign bodies have penetrated deeply into the tissues, as in stake wounds.

Tetanus also frequently follows fractures of bones, castration, tail-docking, harness galls, injuries to the mouth (through sharp teeth), or injuries to the genital passages (from aid in difficult labours), and in the newborn animal by infection through the navel wound.

Since the introduction of the antiseptic treatment of wounds, tetanus occurs less frequently than it did a few years ago.

Symptoms.

In the horse, two types of tetanus may be recognised, the *acute* and the *sub-acute*. In the latter the symptoms are developed slowly, the muscular spasms and nervous excitement are not intense, the muscles of the jaw and neck but slightly involved, and the animal is able to feed. In these cases if treatment be adopted sufficiently early, there is a chance of recovery.

The acute form of the disease is characterised by a rapid development of the symptoms, and the animal usually dies within a few days. The first symptoms noticed are stiffness of the jaws and difficulty in mastication and swallowing, head extended, and the protrusion of the haw, or third eyelid over the inner part of the eye with a flicking movement. The latter symptom is very characteristic, especially when the animal is suddenly disturbed or excited. The muscles of the neck and along the spine become rigid and the legs are moved in a stiff manner. Noise or disturbance throws the animal into increased spasms of all the affected muscles. Another symptom is that the tail is usually slightly elevated and held immovable. Constipation sets in early in the attack. Temperature and pulse are

not much changed. In the acute type the symptoms become rapidly aggravated, until all the muscles are rigid, the jaws become completely "locked," and a cold perspiration breaks out all over the body, breathing becomes painful, the lips are drawn tightly over the teeth, the nostrils dilated, and the animal dies in great agony.

In the severe cases recovery seldom takes place. Those cases that set in rapidly with inability to swallow and violent convulsions are usually fatal, whereas a case that sets in slowly and lasts fourteen to fifteen days, if carefully nursed in proper surroundings, may be looked upon favourably.

In sheep the disease occurs in the acute form. Stiffening of the muscles, with spasms of the muscles of mastication, is usually present. The animal stands with legs well apart, and usually marked elevation of the nose and tail. When down, the sheep lies on its side with limbs extended straight and rigid, and the head thrown back. The mortality is almost 100 per cent.

In cattle the symptoms resemble those in the horse, but are not so severe. In mild cases rumination is performed with some difficulty, while in acute cases it is entirely suspended; mastication and swallowing become impossible, obstinate constipation sets in, and in a variable period the animal falls down and dies in violent convulsions. The mortality is high.

Tetanus may possibly be confounded with spinal meningitis, or with forage poisoning in the horse, but the movement of the third eyelid across the eye would in itself be a means of distinction.

Prevention.

Where a valuable animal has sustained a severe wound, a qualified veterinary surgeon should be called in. Tetanus anti-toxin is used with more success as a preventive than as a curative agent. In any case, if the serum treatment is to be adopted it should be employed in the early stages or before the disease has set in.

Further prevention consists in keeping all wounds clean by bathing with lysol solution, 2 to 3 per cent., or with some other antiseptic.

In connection with lamb-marking, care should be taken that all knives and instruments are boiled before use, and that a solution of antiseptic is available at the yards to dip the knives in from time to time. It is preferable to mark lambs at temporary yards erected in the paddock.

Treatment.

Keep the animals quiet by placing them in a darkened stall, away from other animals, the floor being bedded with sawdust, sand, or short straw. Have available a fresh supply of cool drinking water, placed in a convenient position on a level with the animal's head. Feed on soft, sloppy, and easily digested food, and if the animal will take magnesium sulphate (Epsom salts) or potassium nitrate in the feed so much the better, or it may be dissolved in the drinking water. The attendant must be very careful and quiet, to prevent unnecessary excitement and increase of the spasms. Drenching should not be attempted. If there is a wound it should be thoroughly cleansed and disinfected with 4 per cent. carbolic acid or other antiseptic.

Green Colour in Butter.

A. M. BROWN, Senior Dairy Instructor.

EARLY in the month of October, 1923, it was noticed that butter from a number of factories in the Hunter River district, when freshly made, had a dull, lustreless appearance, which after a short time developed into a greyish-green colour. The texture also appeared to be abnormal, it being similar to that of soap, with no granular formation, as in normal butter.

So pronounced did this abnormality become that the butter became unsaleable on the local market, and a very serious position was created for the factories concerned.

The Dairy Expert, recognising the situation, made arrangements for an officer of the Dairy Branch to investigate the cause of the trouble with the co-operation of the Chemist of the Department.

It was decided to carry on these investigations at the Scone factory, where badly-affected butter was being manufactured.

On 23rd October a visit was paid to a farm at Scone, the cream from which was known to have produced butter having this peculiar colour. The pastures, especially those on the flat country, were found to be infested with myriads of aphis, some of a dark grey colour, others green. Samples of the herbage on which large numbers of these insects were visible were forwarded to Sydney for examination by the Chemist.

It was observed that most of the cattle in the herd were affected with a skin irritation, white patches being in some cases red raw, and in others scabs had formed on the affected parts.

Although at this time no aphis were actually seen on the irritated patches, the statement was afterwards made on several occasions by persons interested that these insects were the primary cause of the condition of the skins of the cattle, which were in a bad state in this regard.

A can of cream produced on this farm was selected at the Scone Co-operative Dairy Company's factory, and with the co-operation and assistance of the manager, Mr. R. Marshall, several experiments were carried out.

No. 1 Experiment.

Part 1.—The cream had a very slight flavour, similar to a metallic flavour, combined with an astringent taste which left the palate quite dry, as after tasting metal. Otherwise, no other peculiarity could be noted in the flavour. It was a rather thick cream, and appeared well separated.

Of this cream 2¼ lb. was taken. The acidity, ·44, was reduced to (theoretically) ·24. The cream was heated to 176 deg. Fah., by immersing in boiling water and stirring continuously. This method, which was the only one

available at the time, proved rather slow, but as it took fully a quarter of an hour to raise the temperature of the cream from 145 deg. to 176 deg., the process took the form of the holding system of pasteurising. The cream was then cooled to 60 deg. by immersing in brine at about 40 deg., being well stirred meanwhile, and left immersed in brine all night.

The acidity of the cream next morning before churning was ·29; temperature of cream 56 deg.; of water 50 deg.; grain small, washed well. The butter was divided into two lots. One was salted (rather heavily), the other was left unsalted. Both were thoroughly worked with pats, using a pressing action as similar as possible to that of the worker.

The colour of this butter when finished was a dull, greyish hue, but after standing in the cold room for some days it developed a distinct green colour. Its appearance was almost identical with some makes of green soap. The unsalted sample was slightly lighter in hue than the salted, although quite green.

Part 2.—Some of the same cream was churned without pasteurising. Acidity ·47; temperature of cream 52 deg.; of water 48 deg. The cream had become very thick after standing in the can for twenty-four hours, and it was distinctly metallic in flavour. It was churned to very fine grain and well washed, and was worked exactly similarly to No. 1, after being divided into two lots, one being salted and the other unsalted.

The butter had also a dull, greyish appearance when first made, but after standing in the cold room for some days it had developed a dull greyish yellow colour distinctly different to the green colour of Part 1 butters. In this instance, also, the unsalted sample was lighter in hue than the salted.

No. 2 Experiment.

Part 1.—A can of cream from a different farm was selected for No. 2 experiment. Butter had previously been made from cream produced by the herd on this farm, and had been of a very bad colour. The cream, of which 2½ lb. was taken, showed an acidity of ·49, which was reduced to (theoretically) ·2.

A primus stove was used to heat this cream up to 186 deg. Fah., the heating being done much quicker than in No. 1 experiment. The cream was quickly cooled to 60 deg. in brine, and ½ pint of indifferent starter was added. Two starters had previously been prepared, as it was desired to ascertain what effect, if any, the production of lactic acid would have on the colour, but, unfortunately, neither starter produced enough acid to coagulate the milk, while a flavour similar to that of burnt nuts had been produced in each instance.

This cream was churned the next day. The acidity of the cream at churning was ·29; temperature of cream 49 deg.; of water 49 deg.; very fine grain, ell washed. Butter divided, and salted and unsalted made. The

butter tasted like the starter, and the colour was very dull, but much better than previous lots, although after standing for some days a greenish tint developed. The unsalted portion was a slightly better colour than the salted.

Part 2.—Some of the same cream was churned without pasteurising. Its acidity was ·51; temperature of cream 52 deg.; of water 50 deg.; fine grain, washed well. Butter divided, and salted and unsalted made. The salted sample was a dull colour lacking in brightness. The unsalted appeared almost normal, although a trifle highly coloured.

After standing for some days the salted butter had become a dull greyish colour, while the unsalted had altered very little, if any, being practically normal in colour.

While at this factory an opportunity presented itself of comparing the colour of some butter made on a farm where the aphis pest was not very prevalent with that made from cream off country which was infested with those insects. The former butter was almost normal in colour, while the latter was a dirty deep grey colour.

A little of each of these samples was dissolved in ether, thus freeing the curd, which in the case of the first butter was perfectly white, and in that of the second a dirty grey colour. The fat in each appeared quite normal in colour.

General Remarks.

Samples of the butter made in connection with Experiment No. 1 were submitted for examination to the Chemist, who reported on them as follows:—

No. 1.	Butter made from cream pasteurised,			salted.
,, 2.	,,	,,	,,	unsalted.
,, 3.	,,	,,	unpasteurised,	salted.
,, 4.	,,	,,	,,	unsalted.

Nos. 1 and 2 had a peculiar green colour resembling palmolive soap; Nos. 3 and 4 had no green colour, but were of a dirty flat yellowish-red tint. The texture of these butters was abnormal, and was not granular, but slimy and in Nos. 1 and 2 this was more pronounced than in Nos. 3 and 4. All the samples had a peculiar smell.

On melting these butters and filtering off the fat, it was noted that, though not normal, it was nearly so, and possessed the usual pleasant characteristic odour of butter-fat.

The separated curd from all samples was very dark coloured, that from Nos. 1 and 2 being of a black-blue-grey colour; that from Nos. 3 and 4 was similar, though the colour was not quite so deep.

All these curds gave reactions for tryptophane and tyrosine, indicative of protein decomposition or hydrolosis.

On examining the curd for melanin certain definite reactions were obtained, but as these are all colour reactions they cannot be regarded as absolute, and it is most probable that the dark substance is a melanoid. All the evidence we can accumulate is in favour of the dark colour being of melanin origin.

Laboratory Tests.

From the specimens of aphis which had been sent to Sydney the Chemist selected a number of one species, which were of a reddish colour, and an extract was made from them which was of a blood-red colour. On this extract being mixed with cream the resultant mixture was of a pink colour. This cream was heated to 66 deg. Cent. and held for twenty minutes and then cooled. It was then noted that the pink colour had disappeared. The butter made from this cream was of normal appearance and no abnormal colour developed afterwards.

A further portion of cream was mixed with an extract prepared from the plant leaves which accompanied the aphis, in order to ascertain whether any darkening would be produced by enzymic action. The butter produced from this cream appeared normal, and developed no abnormal colour on being kept.

Samples of butter having this abnormal colour and appearance, which were forwarded from the Denman, Scone, and Tamworth factories, were examined by the Chemist, and they all closely resembled each other in many respects, differing mainly in the degree of abnormality of the colouration. The Chemist's report on these butters was mainly similar to that furnished by him on the experimental butters previously dealt with. He found that the melting point of the fat was lower than is usual in average butters. The curd had apparently suffered certain decomposition (hydrolosis), both tyrosine and tryptophane being present. Definite reactions indicative of melanin were obtained from the curd.

The presence of iron (largely in ferrous state) was detected in the curd, but this cannot be taken as absolute proof of the presence of melanin, for though some melanins do contain iron there are apparently others which do not contain this element.

It appeared more than probable that the peculiar colour showing in all these butters was of melanin or melanoid origin, and is in some way connected with the presence of both tryptophane and tyrosine, though at what stage of the process (from the secretion of the milk to the manufacture of the butter) the necessary reactions take place is at present uncertain.

The Chemist also draws attention here to the fact that, according to reports to hand, many of the cattle on affected areas appeared to be suffering from a form of dermatitis, which may possibly be connected with the abnormality observed in the butter.

The Chemist supplies the following brief note on the nature of the dark-coloured substances melanin and humin, the former of which is mentioned a number of times in this article :—

" It is well known that when proteins are subjected to hydrolosis (decomposition), especially acid hydrolosis, a blackening of the solution occurs, and in time black insoluble particles separate from the solution. These have

been termed by some chemists "humins," and by others "melanoids" or "melanodins," and, owing to the similarity of the "humins," both in colour and solubility, to the naturally occurring melanins, have often been referred to as melanins. This has resulted in a certain amount of confusion.

"Melanins are dark brown, reddish-brown, or black pigments which are found in hair, and in the epidermis or outer layer of skin of dark-coloured animals.

"Humins have been described as the dark-coloured pigments which are usually found upon the acid hydrolosis of proteins, and have been variously ascribed to the presence of tryptophane, tyrosine, &c. A combination specially favourable to the formation of humin is the simultaneous presence of tryptophane and a carbohydrate (sugar). Whether or not these two groups of pigments are one and the same is a point which has not been settled. The composition and reactions are very similar, and the tendency of physiological chemists is to regard them as identical, although conclusive evidence to this end is lacking.

"The ultimate source of the colour of these pigments has been variously attributed to iron, to sulphur, and to particular organic combinations. Many of these melanins contain iron, and considerable work has been done to trace their origin through this element, but since the neucleo-proteins and many albumens also contain iron, and since melanins have been found which are free from iron, no important conclusions could be derived from these investigations."

Deductions.

The reasonable deductions which may be made from the present research work by the Chemist are :—

1. That the dark colour is probably of melanin origin, and is in some way connected with the decomposition of protein, but at what stage the latter takes place between the secretion of the milk and the manufacture of the butter has not so far been determined.

2. That the physical condition of the cattle suffering from severe irritation of the skin would probably be abnormal, and the animals would also probably secrete abnormal milk. This factor may have considerable bearing on the cause of the trouble.

Exactly how the irritation abovementioned was brought about there is no direct evidence to prove, although the general opinion in the district is that the aphis is the cause, either directly or indirectly, and apparently this opinion has not been arrived at without some definite evidence. It is, however, worthy of note that as far as can be ascertained, the appearance of this abnormal colour in butter has been concurrent in each instance with the advent of an aphis infestation.

From personal observations and from the results of the experiments at the Scone factory, further deductions can be made as follows :—

1. That the aphis pest which has been very prevalent in some of the Hunter River districts this year is in some way responsible for this abnormal colour in butter.
2. That the curd is the constituent apparently affected, and that methods of manufacture are necessary which will tend to eliminate as much of the curd as possible from the butter. Thus low temperatures in churning, fine grain, and thorough washing are recommended.
3. That the heating of the cream in the process of pasteurisation apparently accentuates the trouble.
4. That salt also seems to deepen the colour.

The abnormal condition of butter now under review manifested itself suddenly—fortunately for a comparatively short period, and it then disappeared almost as quickly as it had come

The investigations in connection with this matter are so far not complete, but they will be continued if a further opportunity presents itself.

Apiary Notes for April.

The anticipated improvement in conditions for bees has occurred. In some cases a real spring time has been in evidence, and some unusual trouble from swarming, especially among black and hybrid bees, has been in evidence. Though so late, these good conditions should put the bees in the right heart for wintering. The arrangements for wintering are generally finalised during April, and provision should be made for the comfortable and compact condition of the colony, and an ample supply of stores for winter use. There are cases where climatic conditions allow the final work to be carried out later, but that is not general.

The flora in many districts, both inland and on the coast, is already making good prospects for next season in an abundance of new growth for the forming of the buds, and a general healthy appearance of the trees.

The bloodwood (*E. corymbosa*) was flowering in the vicinity of the Government Apiary at Wauchope during March. The nectar secretion was good, and it was especially noticeable that dull cloudy weather improved its nectar secreting qualities. The honey, while of good amber colour, had a peculiar stringy character, which is not generally appreciated. Previous to the bloodwood, we had a short but good flow from trees which thrive in the gullies leading down from the mountain. The Government Botanist says it is "*Backhousia sciadophora* (of the Myrtle family). It is closely related to *B. citriodora* and *B. angustifolia*, both of which species yield an aromatic oil of commercial importance." The honey is light amber in colour, and has a very peculiar flavour. The tree grows to about 30 feet in height, and has a grey-coloured bark of a somewhat stringy nature. The flower is white in colour and is arranged in clusters; fine tendrils lead down from the flower to the stem.—W. A. Goodacre, Senior Apicultural Instructor.

Reduction of High Colour in Butter.

A. T. R. BROWN, Senior Dairy Instructor.

OWING to the prejudice of the local market against the highly-coloured butter that comes from the far South Coast districts at certain times of the year, experimental work has been carried out during the last two seasons at the butter factories at Bega and Pambula with a view to discovering a means of reducing this so-called defect.

The high colour of this butter is most noticeable during the spring months, automatically disappearing as the season advances, but reappearing with a refreshing of the pastures following a good fall of rain. It has been an anxiety to dairy farmers in the far south, and has had the industry somewhat perplexed. Some authorities attribute it entirely to the Jersey cow, which in the part of the State referred to predominates over the other breeds, others to the pastures, and others again to the modern processing of butter and the high temperatures involved in pasteurisation.

The object of this article is not to discuss the first two theories, but to detail the experimental work carried out from the manipulation side of the question.

Experiments at Bega.

In the late spring of 1922 a series of twenty-three experiments was carried out at the Bega Butter Factory. The spring had been a dry one, and the pastures were in practically an advanced stage at the time of conducting the experiments, but the high colour was still prominent in the butter, although not so pronounced as it is sometimes. The creams used were from Shorthorn and Jersey cows, and were treated separately but similarly under almost all the varying conditions possible when manufacturing butter on a commercial scale. The experiments consisted in duplicate of the following creams:—

1. Plain untreated creams.
2. Neutralised with lime, but not pasteurised
3. Neutralised with bicarbonate of soda and not pasteurised.
4. Pasteurised, but not neutralised.
5. Neutralised with lime and pasteurised.
6. Neutralised with bicarbonate of soda and pasteurised.
7. Colostrum added to untreated creams.

Salted and unsalted butter was made from each experiment.

Where neutralising was resorted to, the acidity in each instance was reduced to ·25 per cent.

The resultant butters were examined a week after manufacture, not only by recognised authorities, but by the Bega community as well, and the general opinion was that, with the exception of two, the samples were identical in colour. The two exceptions were the butters made from cream with colostrum added.

It was concluded from these experiments that the modern processes of neutralising and pasteurising cream do not increase the high colour of butter, but that the new milk of cows, when separated as cream, may have such an effect. This would hardly be the main cause of high colour, however, for the colour seems to fluctuate in the spring according to the state of the pastures—after a good shower of rain it will make its appearance, to gradually disappear again.

Experiments at Pambula.

The second series of experiments (at Pambula Butter Factory, in 1923) were carried out with bulk mixed cream, irrespective of the breeds of cows producing it, and just as it was received on the factory platform The experiments simply consisted of dividing each can into two parts when received at the factory, placing one part in one pasteurising vat and the other in a second vat. The cream in one vat was treated in the manner usually followed at this factory, and that in the other by adopting lower acidities and lower churning temperatures. The usual practice at this factory was to reduce the acidity of the cream to ·25 per cent. with bicarbonate of soda, churn at 51 degrees, and use wash water at 49 degrees. The alterations made for the experimental lot were as follows:—The acidity of the cream was reduced to ·2 per cent., or ·05 per cent. lower than the usual reduction, and the churning temperature used was 47 degrees or 4 degrees lower than usual. The temperature of the wash water was also 47 degrees.

Naturally the colder cream took a longer time in the process of churning and working. The time taken for working was increased by the butter choking in the shelves in the churn and having to be forced out. The butters were salted, and a week after manufacture were examined.

Recognised authorities and persons interested were of the opinion that the butter made from the cream of low acidity and low temperature was decidedly paler than that made from the cream treated in the usual manner, although not quite so pale as the palest northern butter.

It may be remarked, however, that the North Coast factories turning out the palest butter are using the long barrel churns, in which the butter is not exposed to light during working, as is the case in some churns with detachable workers, and it is believed by some authorities that the obliteration of light during working has the effect of producing a slightly paler colour.

There is no doubt about the improvement in texture and body in the butter made from cream churned at the lower temperatures as compared with that made in the way usually followed on the far South Coast, and there is no doubt either that an excessively high colour in butter can be considerably reduced by adopting lower acidities and lower temperatures.

Consignments of butter to Sydney from Bega, Pambula, and Cobargo butter factories manufactured with lower acidities and temperatures have confirmed the experimental results by grading 94 points and as high as 95 points—points hitherto practically unknown in the Bega and surrounding districts.

Dairy Farm Buildings.

THEIR GENERAL OUTLAY AND CONSTRUCTION.

[Concluded from page 216.]

L. T. MACINNES, Dairy Expert, and A. BROOKS, Works Superintendent.

Reinforced Concrete Slab Dairies.

IN dairy buildings of all descriptions, concrete is being used much more to-day than formerly. Its advantages over other materials, such as wood, fibro-cement, and galvanised iron in the erection of dairies on farms have not been stressed sufficiently in the past. Almost ninety-nine out of every hundred of the dairies in this State are built of wood with a galvanised-iron roof, the floors being, of course, in all cases of concrete. If brick, stone, or concrete buildings were suggested the question of greater cost would at once be raised, and it is an argument there is no gainsaying as regards brick, stone, or solid concrete walls; but it is doubtful if it applies to concrete slabs, such as are now being used successfully by the Railway Commissioners in constructing railway stations, signal boxes, and even water tanks.

The advantages of concrete slabs over wood are apparent. Concrete walls are practically everlasting, they are proof against white ants and dry rot, they do not warp and crack with the weather, they do not require frequent coats of paint to preserve them, and they make a far cooler dairy than when wood and iron are used, especially if the cavity wall style is erected.

To make these slabs is very simple—any farm hand could do it after a little experience. First must be decided the size and thickness of the slab—it may be any size up to, say, 3 feet long by 1 foot wide and 3 inches thick, which is the largest that can be properly handled by the builder. Select a level piece of ground and sweep it clean of rubbish and stones, giving it an even and level surface; get ordinary 3 inch x 2 inch dressed pine battens and lay them parallel to each other, and place between them cross battens of the same size, or 3 x ½ inch iron at intervals to suit the length of slab being made. Spread on the ground in the spaces to be filled sheets of newspaper; this keeps the under surface of the slabs clean. Properly mix the cement, sand, gravel or ashes (say three of sand to one of cement, or 9 cubic feet of gravel and sand or ashes to each bag of cement), fill in the concrete on to the paper, level with the top of the battens, and smooth off with a steel trowel, finally placing wet bags over the top to keep the slabs from drying too quickly. In two days the battens can be taken away and the slabs picked up. The paper on the bottom sides can be easily torn off; this side is a little rough, but can be used for the inner or cavity side of the walls. The number of slabs that can be thus made at one time is only limited by the desire and capacity of the workers. Every care should be taken thoroughly to mix the materials together for the concrete.

In relation to concrete slab erections there is great scope for co-operative effort on the part of dairy-farmers, either through their co-operative dairy companies or through their various agricultural organisations. The sand,

gravel, or cinders necessary for the making of concrete slabs are not easily procurable on every farm, but a solution would be to make the slabs at some selected spot, where the cement could be delivered at the lowest freight cost, and where good sand, gravel, or cinders could be obtained in large quantities and at a low cost. Such spots exist on all of our coastal rivers and near any of the large towns or factories in our dairying districts where coal is used as fuel in large quantities. Slabs for a complete concrete dairy could be made at these places in any quantity, and marked with a number to fit in with their places in the building. Any member wanting a 12 x 10 x 10

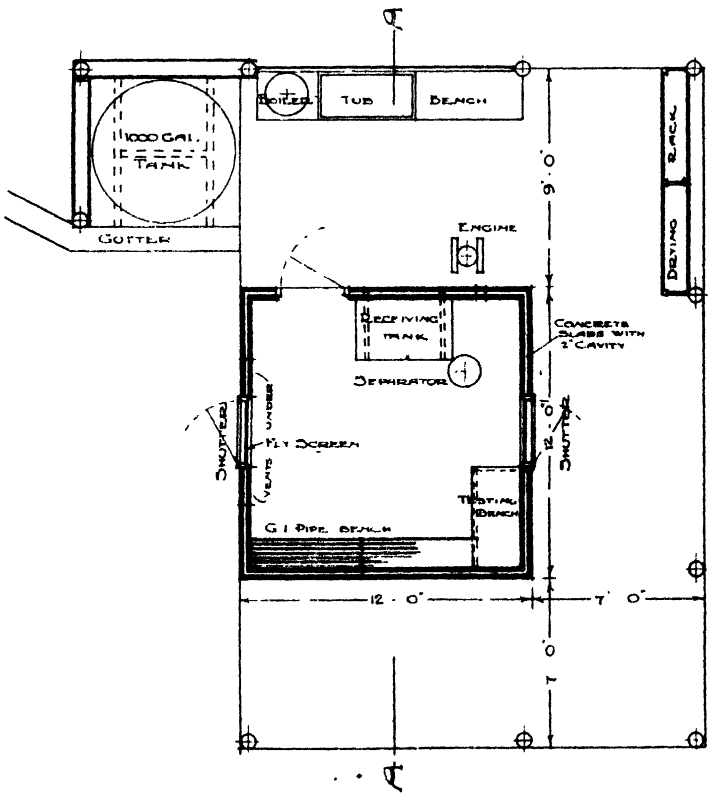


Fig. 38.—Plan of Combined Dairy and Separating Room.

feet dairy with corresponding verandahs could send in his order and have the requisite number of slabs sent out to his farm, where he could quickly erect the building with farm labour. There are various designs and patents for making concrete slab buildings with cavity walls. To get a well-constructed cavity has been difficult, but the advantages are worth striving for; with cavity walls properly constructed there should never be any dampness in the inner wall—a big consideration where mould infection in milk or cream is feared. Such a building would make for a much cooler dairy, and consequently for better quality milk and cream. Reinforced concrete

slabs used for roofing do away with the necessity of ceilings, and are also far cooler than iron roofs. Such roofs may be either of the flat or low-pitched gable types.

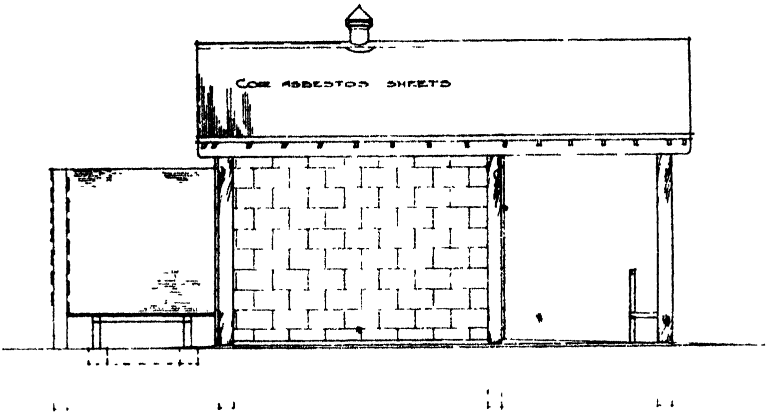


Fig. 34. Side Elevation of Fig. 33.

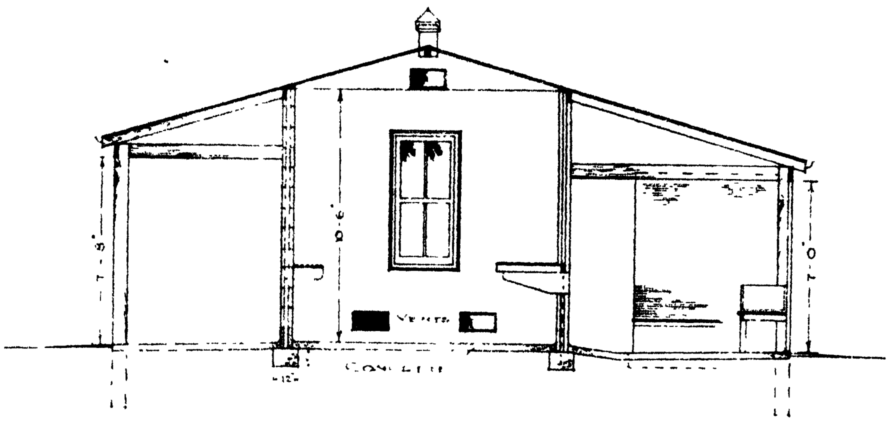


Fig. 35. Section A -A of Fig. 33.

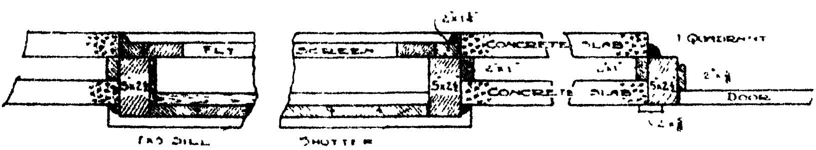


Fig. 36.—Details of Windows and Door Frame.

In America much attention is being given to concrete slab dairies. The latest American magazines feature them, the accompanying Fig. 37 being taken from *Hoard's Dairyman*, of July, 1922. In this it will be noted that no provision has been made for a verandah; nor, as far as can be judged from the particulars available, has allowance been made for the minimum amount of ventilation (24 square feet) laid down in our dairy regulations.

The accompanying plans show a combined dairy and separator room built with concrete slabs, as promised earlier in these articles. The specifications are as follows:—

SPECIFICATION.

Concrete.—All concrete for the making of the wall slabs, brackets, &c., to be composed of one of the following mixtures:—

1. To 9 cubic feet of furnace ashes, add 1 cubic foot of coarse clean sand and one bag of Portland cement.
2. To 6 cubic feet of 1 inch river shingle or crushed stone, add 4 feet of sand and one bag of cement.
3. To 6 cubic feet of sand only, add one bag of cement.

The brackets should be reinforced with No. 8 fencing wires, placed at the four corners about 1 inch inwards and bent to be continuous.

Lintels required for over the doors and windows should also be reinforced with three wires placed about 2 inches from the lower edges. Concrete for the foundation and for the floors may be of stone broken to about 2 inch gauge, or river shingle of that size, with 4 cubic feet of sand and one bag of cement to each 9 cubic feet of the concrete.

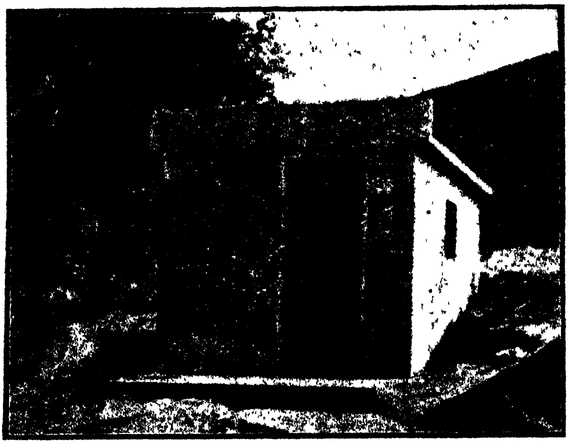


Fig. 87.—The Completed Milk House (all concrete).

Foundations.—Lay concrete footings in square-cut trenches, levelled on the bottom and of the width indicated on the sections.

Walls.—On these footings lay slabs bedded on ¾ inch thick of cement mortar, gauged three parts sand to one part of cement. All slabs to be wet as being laid, to prevent quick drying. Inner and outer slabs to be laid 2 inches apart, and tied together with No. 10 gauge wire ties at 18 inch centres on each third course in the height of the wall. The outer joints to be neatly struck and cut, and the inner joints flat-pointed for colouring.

Damp Course.—At floor level put in a damp course of an approved material, the full width of the walls, lapping at least 3 inches at the joints and bedded in cement mortar.

Vents.—Build in walls and gables where indicated on the drawings vent slabs, outer and inner, with connecting box of plain galvanised iron between the slabs. Ventilator frames to be made of 1 inch angle iron, with strong galvanised wire gauze panel fixed into frames, and the latter set into the slab. Roof ventilators to be of the pipe and cowl pattern, 12 inch diameter, slotted over the ridge, and covered at outlet with fly-proof gauze.

Floors.—Floors to be laid 4 inch thick with falls to surface drains, and continued through door and over verandah. Rendering to be composed of 2 parts sand to 1 part of cement laid on ½ inch thick and trowelled to a hard smooth finish. Form at angle of wall and floor 1½ inch angle fillet, filling in the angle for easy drainage.

Receiving Tank and Benches.—Set brackets in position as walls are built for receiving tank and tester bench, the former to have 3 inch thick slab, with galvanised iron ribs set in to stand up ⅜ inch over the concrete, and set about 6 inches apart. On these will rest the bottom of the receiving tank, the spaces formed allowing free drainage and air under.

Roof.—Construct roof pitched as shown continued over the verandahs supported on 6 x 3 inch verandah plates bolted to lugs of 9 inch diameter posts, the latter set into the ground about 24 inches deep. Return end verandah plates to be set back 4 inches from face to wall and tied with hoop-iron straps turned down into cross joints of slabs. Bed on outer face of side walls 5 x 2 inch wall plates, the ends to project to carry overhang of roofing sheets. Fix 5 x 3 inch shaped ridge pole set into the gable slabs, and to have 2 inch block set in between the slabs to secure ridge. The ends to project as for wall plates. Verandahs to have rafters of 4 x 2 inch spaced at 36 inch centres, scarfed over and nailed to wall plates and birdsmouthed over verandah plates, the feet cut off plumb as shown. Battens to be 3 x 1½ inch notched down flush to top edge of rafters and spaced at about 24 inch centres. Finish at return ends of verandah roof with 3-16 inch thick fibro sheets on gable, fixed to inside of rafter and outside of plate. Cover roof with corrugated asbestos sheets, fixed to makers' specification with their special screws and washers. Gable sheets to project 9 inches and the eaves 1½ inches into the gutters. Cover ridge with 9 x 9 inch fibro ridging, fixed as before specified for roof sheets. On completion point up with cement mortar at ridge and wall plates of room and finish off smooth.

Doors and Windows.—Provide and swing with spring hinges, to door opening, fly screen door, made of good pine, all dressed and framed together, the panels covered with strong galvanised fly-proof wire gauze or perforated zinc. To each window swing similar frames made as indicated, each door and window to be fitted with suitable fastener and handle. Door frames to be 4 x 2½ inch and window frames 5 x 2½ inch with 7 x 3 inch sunk and weathered sills and each secured in walls with cleats and straps.

Can Rack.—On verandah fit up with 4 x 4 inch posts, and 4 x 2 inch rails all dressed, and framed together secured to smooth round posts as shown on plan.

Tub and Bench.—On verandah fit up wood wash tub of the size shown, made of dry 1¼ inch pine, dressed all round, trenched at the joints, painted, and fixed together with 2½ inch brass screws, also at each end put in two ⅜ inch tie bolts with square plate washers. Sides and bottom to project ½ inch all round. Tub to be supported on stand made of 4 x 4 inch legs, 4 x 2 inch rails framed together, and to be continued as bench, covered with dressed 3 x 1 inch battens spaced as indicated.

Tank and Screen.—On 4 inch thick concrete dwarf walls set on footings as indicated and with 4 x 3 inch wall plates bedded on each, lay and spike down 4 x 2 inch decking spaced 2 inches apart. Notch ends into and fix to round posts as shown, 6 x 1 inch boards spaced as indicated, as shade for tank. All boards neatly arrised before being fixed.

Painting.—All dressed wood work showing to be painted three coats of white lead and linseed oil paint coloured to light stone colours or browns. To the whole of the outside of the roof give two coats of King's Compo. or other weather-resisting white water paint, and to inside of dairy, including walls and ceiling, give two coats of mill white; to each gallon mix ½ pint of raw linseed oil.

The cost of this concrete dairy would vary according to the district where the farm was situated, the availability of local supplies of materials and the amount of hired labour that would be used on the job. Assuming that the whole of the work of making and erecting the slabs was done by the farmer himself, and that sufficient gravel or other suitable material was available close by for making the concrete on the site on which the dairy was to be built, the outlay on material for the concrete slabs required to build a 12 x 10 feet dairy such as that shown in the accompanying plan would be about £15, this being the cost of the cement.

Unit Value of Fertilising Materials.

The unit values of fertilising ingredients in different manures for 1924, are as follows.—

	per unit.
Nitrogen in nitrates ...	22s. 6d.
,, ammonium salts ...	18s. 3d.
,, blood, bones, offal, &c. ...	18s. 1d.
Phosphoric acid in bones, offal, &c. ...	4s. 9d.
,, (water soluble) in superphosphate ...	6s. 8d.
Potash in muriate of potash ...	6s. 0d.
,, sulphate of potash ...	6s. 8d.

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bonedust contains 4 per cent nitrogen and 20 per cent phosphoric acid :—

4 × 18s. 1d. = £3 12s. 4d. = value of the nitrogen per ton,
20 × 4s. 9d. = £4 15s. 0d. = ,, phosphoric acid per ton.

£8 7s. 4d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.—A. A. Ramsay, Chemist.

A Move in the Right Direction.

The makers of milking machines (or some of them) have at last recognised the importance of the vacuum, or air line, in the production of high-grade milk or cream.

The condition or the accessibility of the vacuum line has, in the past, received very little consideration or attention by the makers or users of milking machines, largely owing to the fact that its influence on the quality of the milk or cream was not fully understood or appreciated.

The fact that a hygienic vacuum line is just as important as a hygienic milk line in the production of a high-grade milk or cream is becoming more generally recognised, and it is pleasing to note that makers of milking machines are now erecting (in some cases) the whole of the vacuum line, or the vital sections of it, so that easy dismantling and assembling are possible for cleaning purposes.

This is a move in the right direction, as a contaminated vacuum line must result in a contaminated milk supply, and consequently, in an inferior cream.

In the past a dirty vacuum line has been a common cause of low quality cream, and it still exists as a fault in many milking machine plants to-day.

When the least trace of an unpleasant odour can be detected from any section of the vacuum line, steps should be immediately taken to scour and clean thoroughly, as while it remains the production of a high-grade article will be impossible, under most conditions of dairying.—C. J. Macdermott, Senior Dairy Instructor.

Fruit Export Regulations.

E. D. BUTLER, Officer-in-Charge, Export and Import Branch.

ORCHARDISTS and shippers who intend packing apples and pears for export for markets outside the Commonwealth should exercise the greatest care to see that the regulations under the Commerce (Trade Descriptions) Act and Customs Act are complied with; otherwise shipments will be liable to be prohibited from export by the State Supervising Officer.

The requirements in regard to sizes of cases and grade standards were published in the January number of the *Agricultural Gazette*, but in addition the following conditions must be complied with:—

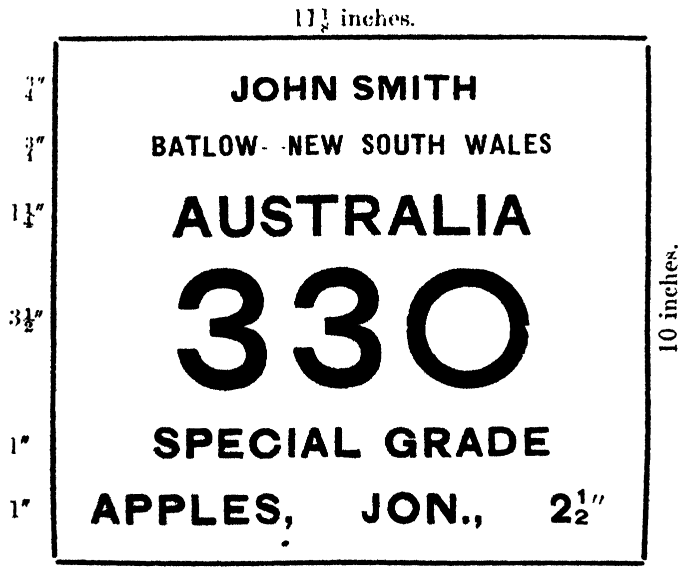
TRADE DESCRIPTION.

1. A trade description must be applied to each case, and shall set out in letters of not less than ¼ inch in height if on printed paper, and not less than ½ in. if stencilled on the cases, the variety of apples or pears, the grade, and the minimum size, viz.:

   "Special," not under 2¼ inches.
   "Standard," not under 2¼ inches, or 2 inches in cases of varieties normally small.
   "Plain," not under 2 inches in the case of apples only.
   No fruit shall be more than ⅛ inch above or below size stated.

2. The trade description shall also set out on one end of the case in letters of not less than ½ inch in height the grower's name (or registered brand) or, in case of a firm or corporation, the firm's or corporate name (or registered brand) and address, and the word "Australia."

The following is a specimen label or brand for trade description, with suggested number for each exporter or grower, and must be applied to one end of the case containing fresh fruit intended for export oversea, and may be in any design suitable to the grower.



The number shown in the specimen label or brand above indicates the number that has been allotted to each London agent, and need only be used in connection with consignments going to London. Each London agent has been allotted a number, and growers should ascertain the number allotted to their particular agent, so that they can include same in the label or brand.

An inspection fee of ½d. per bushel case (*i.e.* two half-cases or three trays) is charged, and fees must be submitted at the time the "notice of intention to export" is lodged.

The notice of intention to export must be lodged at the Export and Import Branch, Day-street, Sydney, at least one clear working day before the proposed date of shipment.

Mosquitoes as a Cattle Pest

Replying to an inquiry as to the best means of protecting cattle from mosquitoes, it was stated that little appeared to be known of effective repellents the use of which would be economically practicable. A number of formulæ had proved useful for human use, but their cost in large quantities would be appreciable, and their effective period was not more than six hours at the most.

As a repellent against flies on dairy cattle a pine tar creosote emulsion had given excellent results for periods of one to three days in the United States, and should be worth a trial against mosquitoes. Coal tar creosote was also used, but butter made from the sprayed cattle was perceptibly tainted with the coal tar odour. No such taint had been reported when pine tar creosote was used, nor was any damage to the hair and skin of the cattle revealed.

A 3 per cent. emulsion had been found effective. The emulsion was made by mixing thoroughly 3 gallons of pine tar creosote with 3 gallons of water in which 1lb. of caustic soda (98 per cent.) had been dissolved, subsequently making up to 100 gallons with cold water. The mixture was applied to the cattle as a spray.—T. McCarthy, Assistant Entomologist.

Factors Influencing an Excessive Drop of Fruit.

Samples of soil were forwarded to the Department recently by the owner of a citrus orchard at Galston, in the hope that their examination might suggest some reason for an excessively heavy drop of fruit.

Analysis showed the supply of available plant-food in the forms of phosphoric acid, potash, and nitrogen to be good. The soil was deficient in lime, however, and its capacity for water was markedly low; the capillary power of the soil was also low. It was therefore suggested that the physical defects should be corrected by the incorporation of organic matter, either in the form of stable manure, or by the growing and ploughing under of green crops. The application of lime was also suggested, either in the form of slaked lime or of ground limestone (carbonate). It was possible that the heavy drop of fruit was caused by lack of moisture during the abnormally dry spring.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat:—

Canberra	Manager, Wagga Experiment Farm, Bomen.
	J. Haggart, Warre Warral.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	J. W Eade, Eade Vale, Euchareena.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
	Mailer Bros., Trundle Park, Trundle.
	H. M. Hall and Sons, Studbrook, Cunningar.
	H. K. Nock, Nelungaloo.
	Hobson Bros., Glenlea, Cunningar.
	R. J. O. Berryman, The Wilgas, Trundle.
	A. Mill, Durran, Gunningbland.
	Mrs. J. D. Berney, Kildara, Cumnock.
	Hughes Bros., Pullabooka.
Clarendon	J. W. Eade, Eade Vale, Euchareena.
	Mrs. J. D. Berney, Kildara, Cumnock.
Cleveland	J. W. Eade, Eade Vale, Euchareena.
	W. Burns, Goongirwarrie, Carcoar.
College Purple	Hobson Bros., Glenlea, Cunningar.
Currawa	J W. Eade, Eade Vale, Euchareena.
	H. K. Nock, Nelungaloo.
Federation	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	Mailer Bros , Trundle Park, Trundle.
	H. M Hall and Sons, Studbrook, Cunningar.
Firbank	H M. Hall and Sons, Studbrook, Cunningar.
Florence	T. R. Jones, Birdwood, Marsden Road, Forbes
Gresley	E. J. Allen, Gregra.
	J. W. Eade, Eade Vale, Euchareena.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	Mailer Bros., Trundle Park, Trundle.
	Mrs. J. D. Berney, Kildara, Cumnock.
	Hughes Bros., Pullabooka.
Hamel	Mailer Bros., Trundle Park, Trundle.
	Hobson Bros., Glenlea, Cunningar.
Hard Federation ...	E. J. Allen, Gregra
	Mrs. J. D. Berney, Kildara, Cumnock.
	J Parslow, Kelvin Grove, Collie Road, Gilgandra.
	Mailer Bros., Trundle Park, Trundle.
	H. M. Hall and Sons, Studbrook, Cunningar.
	H. K. Nock, Nelungaloo.
	Hughes Bros., Pullabooka.
Improved Steinwedel	E. J. Allen, Gregra.
Marshall's No. 3	Hobson Bros., Glenlea, Cunningar.
	E. J. Allen, Gregra.
	Mrs. J. D. Berney, Kildara, Cumnock.
	Hughes Bros., Pullabooka.
Marshall's No. 3 (*ungraded*) . .	C. Hayes-Williams, Farm 1,456, Yenda.
Onas	H. K. Nock, Nelungaloo.
Penny	Hobson Bros., Glenlea, Cunningar.
Rymer	Mrs. J. D. Berney, Kildara, Cumnock.

Wheat—continued.

Waratah...	J Haggart, Warre Warral.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	H. M. Hall and Sons, Studbrook, Cunningar.
	Hobson Bros., Glenlea, Cunningar.
Yandilla King	Manager, Experiment Farm, Temora.
	T. J A. Fitzpatrick, Erin Vale, Warre Warral.
	Mailer Bros., Trundle Park, Trundle.
	H. M. Hall and Sons, Studbrook, Cunningar.
	Hobson Bros., Glenlea, Cunningar.
Barley:—	
Cape	Manager, Experiment Farm, Bathurst.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Some Reminders to the Fruit Exporter.

Several points of interest to the Australian grower are touched on in a pamphlet issued recently by Lyon Leatt, Limited, London agents, as a guide for exporters of fruit to Great Britain, and in view of the approach of the export season for apples and pears attention may well be drawn to them.

The pamphlet refers to the advantages of double wrapping and of corrugated cardboard lining for cases used for high-class fruit of the softer varieties, and with reference to grade names states that "the terms 'selected,' 'choice,' &c., should refer to quality only, the size being indicated by marking on the box the number of fruit contained therein." Referring to Australian and New Zealand apples, the pamphlet says:—"We are pleased to report that this year (1923) fruit arrived in much better condition than in former seasons. It would seem as if experience gained in the past is being put to good use. Growers, however, must not relax their efforts, and the greatest possible care must be taken in the grading and the packing of the fruit. One point to which we would draw attention is that some of the earlier shipments consisted of very immature fruit; as the first few boats come into competition with American and Canadian apples, which are in good coloured condition, the demand for the immature Australian fruit is rather poor and prices consequently none too good."

In respect to the reference to immature fruit, it can be claimed that last season at least New South Wales was not guilty.

When attempts have been made to arrange uniform grading rules for Australia very emphatic objections have been made by some States to colour being included as one of the controlling factors, and statements have been freely made that colour does not count on the British market. That there was a greater demand at a higher price for long-stored, well-coloured apples than for the immature fruit of the new crop is only further evidence that colour does count on the British as it does on our local markets.

With reference to grapes from Australia, it is remarked that "only the finest fruit, large berries and bunches, are of any use, as this fruit comes into competition with South African grapes, which are very fine and already have an established market here."

Orchard Notes.

APRIL.

W. J. ALLEN and H. BROADFOOT.

Grading and Packing of Apples and Pears.

HARVESTING is still in progress in many, if not all, of our chief apple and pear districts, many varieties not having yet been completely marketed. Since well packed, sized, and graded fruit invariably commands a higher price than fruit which has not been so well handled, it pays the grower to give great attention to these important points in preparation of his fruit for market. The grower must first see that his fruit is picked and handled carefully. The fruit must not be bruised, nor must the skin be broken. It is essential that the skin of any fruit should be kept in a sound condition, especially when it is intended for cold storage and export. Blemished, undersized, and immature fruit must be put on one side, and not packed with the grades. Blemishes often become a source of deterioration to the whole of the fruit in a case.

Fruit should be firmly packed, and should reach the market in that condition. Apples especially should be packed so as to create a slight bulge in the top and bottom of the case; the tension thus caused has the effect of keeping the fruit in place. Wrapping in paper is so advantageous, particularly in the case of medium and large fruits, that it is well to wrap all grades of apples that average over 2¼ inches in diameter. There are several recommendations for the practice. The packing is tighter, the paper acts as a buffer, and lessens, if it does not prevent, the spread of disease from any affected specimen which may have been put in the case unnoticed by the packer.

If, for any reason, picking during the warm part of the day is unavoidable the fruit should be allowed to cool down before packing. On no account should the case be nailed down on a floor, unless the ends are first placed on two slats, thus giving the bottom of the case an opportunity to "spring," so that the contents shall not be bruised.

Preparation of the Land for Planting.

Some orchardists will be preparing land for planting. Ploughing to a sufficient depth is one of the essentials to successful planting, though the exact depth depends largely upon the character of the soil and subsoil, and the situation of the proposed orchard. The land should also be allowed to sweeten by exposure in the rough to the influences of air and sunshine, and enabled at the same time to absorb winter rains. The soil will then work up to a fine tilth later on.

Planting.

During the month of April citrus trees may be planted in localities where autumn is mild and autumnal frosts are unknown. During transference from the nursery care must be taken to prevent the roots of the young trees being injured, and also from drying out. Bruised roots must be cut off with a pair of sharp secateurs, or with a sharp knife. If the soil be dry it will be necessary to water newly planted trees. Mulching will assist in minimising loss of soil moisture. Manure, if used, should be well mixed with the soil. Quantities of "green" manure should not be placed in contact with the roots.

Orders should now be lodged with nurserymen for deciduous trees required for planting this winter.

Where any refills are to be made in the orchard, a large hole should be dug where the tree is to be planted, and it should be filled with fresh soil. This gives the new tree a better chance to make headway.

Resoiling.

Resoiling alone, or in conjunction with manuring, is of recognised benefit to citrus trees. Suitable surface soil should be spread around the tree to a depth of six to eight inches. The soil should be distributed around the tree in a ring, the inner circumference of which should be just underneath the outer circumference of the tree. That is to say, the soil should not be spread under the branches of the tree. The ring resoiled should be from 3 to 5 feet wide. It is advantageous, if blood and bone is being applied, to incorporate it thoroughly with the new soil before application.

Green Manuring and Cultivation.

It is not too late to sow crops to plough under in districts where the rainfall is sufficient to permit this practice, but as a rule it is preferable to sow them earlier.

In districts of small rainfall early autumn ploughing is desirable, so that the rain that falls during the interval between ploughing and spring may be conserved for the trees for the following season.

Liming.

The autumn is a good time to carry out this work. If quicklime is used it should be distributed in heaps over the land, and covered with soil. When the lime is slaked it should be spread evenly over the surface and cultivated in.

A farmers' bulletin, entitled "Lime on the Farm," which deals fully with the subject, and explains the action of various forms of lime, may be obtained on forwarding 7d. to the Under Secretary and Director, Department of Agriculture, Sydney. Growers would be wise to study this publication before purchasing any form of lime.

The Preparation of Home-made Tobacco Wash.

Nicotine Content and Percentage Extraction.

A. A. RAMSAY, Chemist, and E. L. GRIFFITHS, B.Sc.

Nicotine in one form or another is largely used in orchard practice as a spray for trees affected by woolly aphis and other sucking insects, and as a source of nicotine a proprietary preparation of American origin, containing 40 per cent. nicotine sulphate, has for long been extensively used. With the advance in price of this product, however, the question of a substitute, equally suitable for use in a combined spray, has become one of importance. Such a substitute, it was found, was obtainable in the form of an inexpensively prepared home-made wash. The results of these investigations were discussed in the *Gazette* of January of last year, page 58.

Prior to that, various methods had been recommended for the preparation of home-made tobacco wash. These vary considerably, and it was considered desirable that definite information should be obtained as to the results given by these various methods of extraction, and the following investigational work was carried out with that object in view.

The tobacco dust used in the experiments was obtained by purchase in the retail market. The following figures refer to the mechanical condition of the sample, which had been thoroughly mixed :—

91·3	per cent.	passed through a sieve,	12	meshes per linear inch.
59·9	,,	,,	30	,,
51·3	,,	,,	50	,,
34·7	,,	,,	65	,,
26·6	,,	,,	92	,,

The dust contained 13·96 per cent. of moisture and ·782 per cent. nicotine.

In these experiments nicotine has been determined by the official silico-tungstic acid method.*

In the preparation of tobacco washes the proportions generally recommended are 10 lb. tobacco dust to 30 gallons water. In field practice the wash is made double strength and afterwards diluted with water, and the proportion of 2 lb. tobacco dust per 3 gallons water has been adopted.

The following experiments were carried out :—

No. 1.—2 lb. tobacco + 3 gallons water. The water was heated to boiling point and allowed to stand in contact with the tobacco for twenty-four hours and stirred frequently.

No. 2.—As in No. 1, but with the addition of 0·89 grams anhydrous sodium carbonate.

* Methods of Analysis A.O.A.C., published by A.O.A.C., Washington. D.C., 1921.

No. 3.—2 lb. tobacco dust + 3 gallons water. Extraction done in the cold for twenty-four hours.

No. 4.—As in No. 3, but with the addition of 0·89 grams anhydrous sodium carbonate.

No. 5.—2 lb. tobacco dust + 3 gallons water + 7 oz. lime; extracted in the cold for twenty-four hours.

No. 6.—2 lb. tobacco dust + 3 gallons water extracted in the cold for three days, stirred twice daily.

No. 7.—As in No. 6, but extracted in the cold for seven days, stirred twice daily.

The results obtained are set out in the accompanying table :—

No. of experiment.	Diffused liquor obtained.			Diffused liquor obtained expressed in percentage of total diffused liquor.			Grams nicotine contained in diffused liquor.			Nicotine obtained expressed in percentage of total nicotine in tobacco.			Composition of diffused liquor. Grams per 1000 c.c.	
	Diffused liquor or extract decanted.	Diffused liquor retained by tobacco.	Total diffused liquor or extract.	Decanted.	Retained.	Total.	Decanted.	Retained by tobacco.	Total.	Diffused liquor decanted.	Diffused liquor retained.	Total.	Nicotine.	Total solids.
	c.c.	c.c.	c.c.	%	%	%	Gr.	Gr.	Gr.	%	%	%		
1	11,460	2305·7	13765·7	83·25	16·75	100·0	4·5152	·9082	5·4234	63·65	12·80	76·45	·3940	21·42
2	11,440	2325·7	13765·7	83·10	16·90	100·0	4·4845	·9116	5·3961	63·22	12·85	76·07	·3920	22·69
3	11,600	2165·7	13765·7	84·27	15·73	100·0	4·5623	·8517	5·4140	64·32	12·00	76·32	·3933	19·91
4	11,720	2045·7	13765·7	85·14	14·86	100·0	4·5239	·7896	5·3135	63·77	11·13	74·90	·3860	19·88
5	10,600	3165·7	13765·7	77·00	23·00	100·0	4·2538	1·2704	5·5242	59·96	17·91	77·87	·4013	18·44
6	11,430	2335·7	13765·7	83·03	16·97	100·0	4·7777	·9763	5·7540	67·35	13·76	81·11	·4180	20·72
7	11,670	2095·7	13765·7	84·78	15·22	100·0	5·1600	·9266	6·0866	72·74	13·06	85·80	·4426	20·01

Study of the table will show that the mean extraction obtained in the two-day period is only 76·32 per cent. of the nicotine present in the tobacco. In the three-day period the extraction is 81·11 per cent., an increase of 4·79 per cent. In the seven-day extraction period the extraction obtained was 85·80, being an increase of 4·69 per cent. over the three-day period and 9·48 per cent. over two day period.

The table also indicates that in the preparation of washes 16 per cent. of the water used is retained by the tobacco after the operation, while 84 per cent. is obtained as decanted liquor. It will be noted that 23 per cent. is retained in the case of No. 5. This is due to the matters precipitated by the lime settling to the bottom, with the result that a slightly less amount of clear liquid has been obtained.

The figures also show that 64 per cent. of the total nicotine present in the tobacco, is in the clear liquor which is decanted off the tobacco, and that 12 per cent. of the total nicotine in the tobacco remains with the liquor held by

the residue, indicating the necessity for washing the residue with further quantities of water, adding such washings to the original clear liquor and then diluting to the necessary volume for spraying.

It is also interesting to note that in Nos. 1 and 2, when the water has been brought to boiling point, the total extractive matter per 1,000 c.c. is higher (22·56) than in Nos. 3 and 4, when the water was cold (19·89), although the nicotine extracted was practically the same, ·393 and ·390 respectively. The use of lime reduces the amount of total solids extracted (18·44), while the nicotine extracted is slightly higher (·401). That is to say, the use of lime precipitates some of the impurities which are present and produces a liquor which is freer from organic impurities. It was found that on keeping the liquors drained off from the various trials, mould growth developed very quickly in Nos. 1, 2, 3 and 4, whereas No. 5 remained bright and clear. This is a further proof of the superiority of the lime-tobacco extract.

These experiments indicate that the nicotine present in tobacco may not exist entirely in combination with organic acids, such as mallic acid, and that part at least of the nicotine exists in a form or combination which is difficult to diffuse, or which is insoluble in water.

It is also interesting to note that the results obtained for the percentage of nicotine extracted are in agreement with the amounts of extraction obtained in American practice.

A Remarkable Recovery.

An odd accident and a remarkable recovery is the comment that might fairly be made concerning the bull shown in the accompanying photograph. Lying down in some hot ashes last October, it had a heavy canvas rug burnt off its back, receiving injuries of which the picture gives some indication. The animal, which is the property of Messrs. Taylor Brothers, Tanja, Bega district, is a valuable one (having been bought for 60 guineas at the Sydney Show of 1923) and every effort was made to save it, and for four days it was kept under hypodermic injections of morphia, stimulants being meanwhile administered.

A Young Bull, whose cover was burnt off him.

The photograph which was taken three months after the injury was sent in by Mr. Stock Inspector Hessin.—Max Henry, Acting Chief Inspector of Stock.

USE OF COD-LIVER OILS FOR STOCK FEEDING.

INVESTIGATIONS* indicate that beneficial results are obtained from the feeding of cod-liver oil to stock. Oil used for cattle-feeding should be clear and bright, and have an acidity not greater than 10 per cent. and a colour not deeper than golden-yellow. It should also give a strong purple colour when three drops are dissolved in a 3-cc. petroleum spirit (boiling point 40-50 degrees Cent.) and one drop of sulphuric acid is added, since chromogenetic substance and vitamine content are roughly parallel. To pigs, ½ to 1 oz. should be fed daily; to sows in pig, 1½ to 2 oz.; to cows, ½ to 2 oz. Up to 4 oz. per day does not impart fishy flavour to milk or butter.

The available data concerning the vitamine content of cod-liver oil and whale oil is as follows:—

	Vitamine A.	Vitamine B.	Vitamine C.
Cod-liver oil ...	† † †	Doubt as to presence or relative amount.	No appreciable amount.
Whale oil ...	† †	Evidence lacking ...	No appreciable amount.

No data is available concerning the vitamine content of shark oil.

In the investigations referred to it was found that cod liver oil does not considerably increase the milk yield or the fat content; neither does the increase of vitamine content increase the quantity of lipochrome pigment. In the control cows not receiving cod liver oil there was definite improvement in Vitamine A content as the experiment progressed, though it was still considerably lower than that of the cod-liver oil group.

Mr. J. A. Robertson, Herdmaster to the Department, states that he has had experience with the feeding of calves on cod-liver oil and faterine (the latter being, it is understood, pure shark oil), and has found that both can be used successfully, with care, in the feeding of calves, but that they do not give as good results as the calf jelly used by the Department made from linseed meal and pollard.—A. A. RAMSAY, Chemist.

* By Messrs. Drummond, Zilva, and Golding, *Journ. Agri. Sc.*, 1923, 13, pp. 153-162; also *Analyst*, No. 568, Vol. 48, p. 337.

IMMIGRATION OF FAMILIES AT REDUCED RATES.

THE Director of Labour Exchanges and Immigration has received cabled information from London to the effect that arrangements have been made with the Imperial Government for a substantial reduction in the cost of the passages for families who desire to emigrate under the assisted passage scheme from Great Britain. Hitherto all persons over 12 years of age have been required to pay full fare, *viz.*, £22, while children between the ages of 3 and 12 were required to pay half-rates.

Children over 12 and under 16 years will now be accepted at half-rates, while those under the age of 12 will be carried free, the Commonwealth and the Imperial Government paying to the shipping companies the difference.

Farmers and others who are in a position to provide for married men should take advantage of this opportunity for bringing friends and relatives from Great Britain under these specially favourable conditions.

Attention is also drawn to the opportunity for nominating through the local church bodies employees who would be selected by the churches' representatives in Great Britain.

Poultry Notes.

April.

JAMES HADLINGTON, Poultry Expert.

No time should be lost now in making preparations for the breeding season. It is a good plan to have the breeders, at any rate the female portion, settled in their pens by 1st May. The males can be put in at the same time or a week or two later. The aim should be to have fertile eggs available for the first week in June, so that a start can be made with incubation at that time.

The benefits arising out of early hatching of at least a portion of the output of chickens has been so often emphasised in these notes that a repetition of the pro's and con's in this connection should be unnecessary. Most experienced poultry farmers have learnt the lesson. Those with less experience will do well to follow the example set in this respect. The tendency, however, is for many farmers of two or three years' standing to imagine that they are making discoveries. One of these is that early chickens are less profitable than those hatched later in the season. Mature experience will show this to be a fallacy. The importance of having some early stock cannot be over emphasised. It does not, however, follow that even if it were possible, it would be wise to hatch all chickens as early as June or even July. On the other hand, it is folly to leave all the hatching to August and September. The best course is to spread the hatching over the months June to September. This course can, however, only be pursued properly where the hatching is done on the farm and where the farmer keeps his own breeding stock.

Early Maturity.

Right here is a lesson that might be conveyed. One of the main considerations in favour of early hatching is the better development obtainable, which in itself should form the foundation, as it were, of a robust flock of the age from which the breeding stock should be selected. It is observed, however, that the early stock on many farms lack the high-class development that they should exhibit. In this connection it is necessary to make a distinction between growth and maturity; the terms are not synonymous. A bird may arrive at maturity—indicated by early laying of the pullets and by large combs and complete feather furnishings of the cockerels—and yet lack the size so desirable in breeding stock. Observation and inquiry into these cases generally reveals the fact that faulty feeding or rearing, or both, are responsible for the deficiency in growth.

One of the errors into which many fall is that they feed the morning mash as set out for layers to the growing stock two or three times per day, or in the case of dry mash, all day. This is wrong, as will be readily understood when the matter is explained. It is this wise: The morning mash or the

dry mash, as usually constituted, contains the largest amount of nitrogenous matter necessary in the case of layers to balance the ration. When growing stock are fed principally on this the daily ration is too narrow, and they are forced to early maturity, lacking the development necessary before that stage is reached. Small pullets and too early laying is the result, while the cockerels are undersized, with large combs and full feather furnishings. Growth has practically ceased when they should still be growing.

A perusal of the scheme of feeding from hatching to maturity, as set out in my leaflet, "Rearing and Feeding," will show that only one feed per day of the mash mixture as fed to layers is permissible for growing stock. In the item "Ration twelve to twenty-four weeks," the addition of 5 per cent. M.I.B. Compo Meal to the mash will be found *in one feed only.* It appears this is being overlooked on many farms, and a mash containing the same amount of concentrates, and therefore supplying highly nitrogenous matter, is being fed all day except for the evening feed. This, of course, constitutes a daily ration that is too narrow, *i.e.*, the amount of protein is too large in relation to the amount of carbohydrates. Early maturity with small birds as already indicated is the result.

Another cause of too early maturity without sufficient growth is too much concentration in rearing, too many chickens in one house, or rearing on a too limited area. These will each bring about a similar result or aggravate the trouble already referred to.

The time to visualise all these points is right now at the commencement of the breeding season, when there is time to make the necessary arrangements.

Treatment of Breeding Stock.

What is true with regard to forcing maturity is also applicable to the feeding of breeding stock. Many farmers are obsessed with the idea that highly nitrogenous food is necessary for the breeders. As a matter of fact the reverse gives better results. Experience proves that a ration rather wider than that used for layers gives the best results in chickens. Overfeeding on meat or other concentrated foodstuffs of a high protein content, whether of animal or vegetable origin, will cause failure in hatching. In the feeding of breeding stock the object in view should not be to force laying, as with laying stock, but to secure good hatchable eggs, which will result in hardy, vigorous chickens. This is only possible with rational feeding and treatment of the breeding stock. It is now coming to be recognised that the hen that lays an abnormal number of eggs is the hen that produces a large percentage of puny chickens that are hard to rear. This being the case it is but a common-sense proposition to see how much of the high mortality in rearing is due to the practice of forcing the maximum egg production from breeders.

Table Poultry.

The high prices that good table poultry have realised during the past twelve months appear to be stimulating interest in that part of the business. Many have in mind almost specialising on table poultry in the coming breeding season. If such prices as have been made were likely to be a permanent feature, nothing could be advanced against the proposal.

There is, however, another factor likely to operate against specialisation which it will be well to keep in mind. These recent high prices will be an inducement to hundreds of egg-farmers to rear the cockerel portion of their chickens this season, instead of sacrificing them as formerly. Should this happen something like a slump in prices will be inevitable next summer; it will, therefore, be advisable for poultry farmers to watch closely the trend of events in this matter.

The advice to egg-farmers consistently given in these notes regarding the disposal of cockerels has been to rear them to the age and weight to suit the market, and not to sacrifice them in the way many do. That is to say, as long as grillers make good prices it is sound policy to sell a good portion of the cockerels as such. On the other hand, when the rush of small stuff is coming in and only very low prices can be obtained, it might be better policy to keep the surplus stock on the farm, and to make them into the class of bird that is in better demand. Taking one year with another, this is absolutely sound practice. During last spring, as in most years, hundreds of thousands of cockerel chickens were literally thrown away which later on would have made a handsome return over cost of production.

The fact is that with table poultry it is either a feast or a famine. Poultry farmers will do well to endeavour in every possible way to ensure a more even supply. There are ample cockerels hatched on our egg-farms to meet all requirements, if they were only reared to the stage required.

Preparations for Rearing.

Arrangements for the rearing of the chickens should be completed as soon as possible. Brooders may have to be installed, or perhaps extended, and two months will soon slip past, and the time when they are required will be here. Many applications have been received by the Department during the last few months for the loan of plans for hot water circulating brooders The demand for heaters, it is understood, is largely on the increase, and the system is certainly growing in favour, both in this and in other States.

Modified Plans for Brooders.

Realising the difficulties which the average poultry farmer is up against in respect of employing skilled workmen to instal these hot water plants, the writer has devised a simpler way of constructing the brooders. The new pattern has been installed in one of the brooder houses at the Government

Poultry Farm, Seven Hills. Those contemplating putting in these hot water installations would be well advised to inspect this new method of construction. Plans and specifications will be available at an early date.

To meet those who desire to use hovers on the pipes, a simple idea has been adopted, which can be seen at Seven Hills, where may also be seen different systems for automatic and semi-automatic watering which have been installed for purposes of demonstration. The farm is within 10 minutes' walk from the Seven Hills railway station, about one hour's train journey from the city. A visit can therefore be made from most poultry centres within the metropolitan area in an afternoon.

Apicultural Prospects for Autumn.

During the past three or four years the seasons seem to have become somewhat out of gear, and the apiculturist, in common with farmers generally, has suffered some trying times. The present season is a very poor one from the bee-farmer's point of view—there is certainly something amiss when we read in the daily papers at this period that "any choice honey found a ready sale at 6½d. per pound," for generally the market is over-supplied.

Drought, a rather unusual visitor to the coastal areas, spoiled the promise of good returns, while in the inland districts where there were good prospects, a plague of Rutherglen bugs and other insects gave the bees no chance. The prospects are somewhat improved for the autumn, however, and although the crop will be light (the best of the season having passed) bee-farmers are anticipating some return and generally hoping that their bees will be able to go into winter in good order.

As a good deal of replacement of queen bees goes on during the autumn, it is a good plan to select for breeders Italian stocks which have proved themselves during the trying periods. During the big drought a couple of years ago it was noticed that apiarists situated near to one another frequently obtained quite different results, one losing perhaps all his stock and the other saving 60 per cent. In such circumstances success may be attributed equally to the bees and to their management.

It is interesting to note that Victorian bee-keepers are forming a co-operative company, the functions of which will include the supply of material. Such indications that bee-keepers in other states are tackling the marketing question should have some significance for progressive apiarists in our own State.—W. A. Goodacre, Senior Apicultural Instructor.

Hens that Lay Twice Daily.

At one time it would scarcely be believed that a hen could lay two normal eggs in one day, but since the establishment of single-pen testing many hens have been discovered that occasionally lay twice daily. Over-stimulation is a probable cause of the phenomenon, which simply means that two yolks leave the ovary cluster in one day, and are dealt with perfectly.—J. Hadlington, Poultry Expert.

Some Notes on Almond and Walnut Growing.

Almonds are better suited to our inland than our coastal districts; they do not crop satisfactorily on the coast, and the husk has a tendency to cling to the shell instead of cracking off as the nut ripens. On the tablelands late frosts affect the cropping, the almond blossoming very early, and here also the husk often fails to crack away from the shell.

The almond has principally been grown as a wind-break for other trees, although in the Junee and Young districts a few small areas are planted entirely with almonds. In normal seasons the rainfall in these districts is sufficient for the requirements of the trees. During drought years the crop is affected, though the trees are very hardy, and provided they are not attacked by white ants, drought will not kill them. In the drier districts farther west, irrigation is necessary. The deep granite inland soils suit the almond well.

It is most important to provide for cross-pollination, for most varieties of almond fail to crop if grown by themselves. Estimates of returns obtained from almonds in departmental orchards are difficult to arrive at, the trees there only being planted as wind-breaks, but the average net return was worked out a few years ago at not more than £17 per acre. Growers state that on the lighter soils of the Murrumbidgee Irrigation Area the returns from almonds are sufficient to warrant their being planted in blocks.

The walnut has not been grown extensively in New South Wales, though a few trees are to be observed on many holdings in our tableland districts. It requires a deep, well-drained soil. Deep river loams, or loams made up of accumulated washings of soil from higher land, are specially suited to the crop. Although the walnut requires good drainage, it will not crop satisfactorily if it is starved for moisture. Often the tree will have sufficient moisture to form and mature its crop of nuts, but a dry period at the end of the summer and early autumn will seriously affect the next season's crop.

None of the departmental orchards is suited to the walnut. A large number of trees were tried at Yanco Experiment Farm under irrigation, but the conditions there were not suitable, and departmental data on which to form an idea of the prospects of walnut growing are therefore lacking. One difficulty is to secure a plantation of trees of uniform cropping habit. It will often be noticed in a clump of three or four trees that one will be a heavy cropper and the others poor.—W. le Gay Brereton, Assistant Fruit Expert.

Cherry Trees on Japanese Mazzard Stock.

Mr. S. A. Thornell, Fruit Inspector in the Young district, writing of cherry-trees worked on the Japanese Mazzard, said that this stock is to be found in at least two orchards at Young, but the trees are not yet in bearing. Some four-year-old trees of Burgdorf Seedling worked on Japanese Mazzard in one orchard are dying. The scion has outgrown the stock and has apparently suffered from an insufficient flow of sap. For this reason Mr. Thornell does not favour the stock in the meantime.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Royal Agricultural Society of N.S.W.	H. M. Somer	April 14 to 23
Auburn Branch Agricultural Bureau	J. J. Pratt	,, 26
Bathurst P. and A. Association	...	,, 30 to May 2
Hawkesbury District A. Association	H. S. Johnston	May 1, 2, 3
Dubbo P. A. and H. Association	F. Weston	,, 7, 8
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 7, 8
Clarence P. and A. Society	L. C. Lawson	,, 7, 8, 9, 10
Ulmarra P. and A. Society	S. Spring...	,, 14, 15
Narromine A. H. and P. Society	C. E. Skinner	,, 22, 23
Warren P. and A. Association	A. C. Tompson	June 4, 5
Illabo P. A. and I Society	J. M. Hamilton	Aug. 20
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	,, 26, 27, 28
Grenfell P. A. & H. Association	Geo. Cousins	Sept. 2, 3
Cootamundra A. P. H. & I. Association	W. W Brunton...	,, 9, 10
Culcairn P. A. H. and I Society	A. J. Ralph	,, 9, 10
Ganmain A. & P. Association	A. R Lhuede	,, 16, 17
Temora P. A. H. & I. Association	A. D. Ness	,, 16, 17, 18
Junee P. A. and I Society	T. C. Humphrys	,, 23, 24
Corowa P. A. and H. Society	J. D. Fraser	Oct 3, 4
Berrigan A. and H. Society	R. Wardrop	,, 7
Narandera P. & A. Association	W. H. Canton	,, 7, 8
Deniliquin P. and A. Society	P. Fagan ...	,, 15
Griffith A. Society	M. E. Sellin	,, 15, 16
Lismore A. and I. Society	H. Pritchard	Nov. 18, 19, 20

THE SURVIVAL OF A BAD HABIT.

YEARS ago the habit of washing the separator once a day only was quite common, and in itself resulted in a good deal of inferior cream being delivered to the dairy produce factories throughout the State.

In spite of the fact that the industry has advanced rapidly, and made big strides in many directions, it is surprising how this very old and very bad habit still survives the march of progress. Instances are continually coming to light where the habit is still persisted in, regardless of its effect on cream quality.

It is safe to say that 90 per cent. of the inferior cream being delivered to factories to-day is brought about by contamination from improperly washed dairy utensils, not the least of these being the separator parts.

Merely flushing the separator with cold water, or even washing with cold water, is not sufficient. Thorough washing of all separator parts with a clean brush, in lukewarm water, to which a little washing soda has been added, and then steeping in clean scalding or boiling water for at least fifteen minutes, is essential after both morning and night separations.

This is one of the first essentials in the production of a high-grade cream, and if neglected, good results cannot be expected.—C. J. MACDERMOTT, Senior Dairy Instructor.

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The Raising of Fat Lambs.

PAPER AND SPEECHES AT PARKES BUREAU CONFERENCE.

OF several valuable features of the Conference of branches of the Agricultural Bureau held early in April at Parkes the majority of the delegates were agreed that one was of surpassing interest. For two hours the very atmosphere seemed to whisper fat lambs the profits that attach to raising them, and the means by which those profits may be enhanced—and farmers listened with rapt attention as Mr. J. Clatworthy gave his own valuable experience, and Mr. J. B. Cramsie pointed the lessons that twenty years and more have taught the New Zealanders. It was a notable session, and in publishing the following pages the Department commends them to the perusal of every farmer in the western districts of the State.

FAT LAMB RAISING IN CONJUNCTION WITH WHEAT GROWING.

J. CLATWORTHY, "Beechmore," Parkes

THE present is an opportune time to advocate the extension of the fat lamb raising industry in New South Wales, and I am pleased to give the results of my twelve years' experience, which, I hope, may prove of interest to this Conference. Cultivating in some years up to 1,000 acres of wheat, my tendency has been gradually to less wheat and more lambs, until this year the acreage is being sown solely for the sheep. I would like it to be clearly understood that this paper deals solely with fat lamb raising in the wheat belt, in no other way detracting from the great Merino, useful dual-purpose, or longwool sheep of other districts.

The combination of lambs and wheat appears to me so clearly to be the salvation of the soldiers and closer settlement farmers (who occupy an extensive area of this State) that I regret that in so many cases the holdings are cramped, resulting in the whole area being rushed in with wheat each season, and with only one result. If each settler had room for 200 ewes, the wool clip and sale of fat lambs would give an annual return of about £300, and perhaps be the means of turning failure into success. Two contented settlers are a greater asset than three discontented ones.

With the cheap labour countries producing increased wheat totals and the advent of Russia as an exporter the prospects ahead are not too bright for the Australian grower, handicapped by a greater distance from the world's market and very much heavier production costs and handling charges. Even the United States wheat farmers are in a serious position, although they benefited to the full from the high prices ruling during the war period and afterwards. President Coolidge in a special message to Congress said that the economic conditions in certain wheat-growing States were rapidly

approaching a state in which the grower's equity in his farm was being wiped out. The grower's greatest need is *diversification*, the message adds. This latter sentence applies with equal force to the wheat-growers of New South Wales, who, however, are in the fortunate position of having wheat land which is also the equal of the best stock-raising country in the world. By the combination, the wasted feeding values of the stubbles and the cultivated land are converted into profits, and the diseases of wheat (notably take-all, foot-rot, and flag-smut, which are increasing at an alarming rate) are checked.

The benefits to the wheat-grower may be summed up as follows:—

(*a*) By cultivating a lessened area and sowing only on fallow at least an equal quantity of wheat will be produced, while less labour will be needed, the work of the farm being spread more evenly and the rush avoided.

(*b*) By sowing oats on the second-year fallow and feeding off with sheep the fertility of the soil will be increased and the diseases of wheat (take-all, &c.) overcome

(*c*) Returns from the lambs and wool will come at an opportune time to meet the expenses of harvest.

(*d*) A certain yearly return will be assured, thus removing the nightmare of a crop failure.

Having decided on the combination, the wheat-farmer must decide which class of sheep or method of breeding will be the most profitable. Fat lamb raising is the ideal one from every point of view. If Merino sheep are bred, then the results are disappointing, as the lambs will not realise anything like the value of well-bred station lines, while if a dry spring sets in the lambs will probably be unsaleable except at a very low price, and should they have to be kept over the summer then the usual result will follow with overstocking—namely, loss and expense. In September and October, 1922, I disposed of my fat lambs at an average of 26s. per head, and in December purchased Merino lambs at 9s. per head. Crossbreds are a better proposition—should occasion arise there would always be fat sheep ready for market—but fat lamb raising stands alone as the best, and also yields the greatest returns. As the lambs would be disposed of during the spring months at an age of about five months, the farm would be carrying the maximum number during the season of plenty and the minimum during the lean season.

The sowing of the second-year fallow with oats would really mean only the expense of the seed. As the land would be in good order only one stroke of the combined drill-cultivator would be necessary, whereas probably one or more cultivations of the fallow would have been saved by having sheep on the farm. A silage pit could be filled in a flush year, a small stack of hay saved annually, and by reserving from 50 to 100 bags of wheat on the farm until the autumn was assured then the loss of sheep and loss of lambs would be avoided. But to assure success with fat lamb raising only thorough methods must be employed, and the farmer must take an intelligent and

sympathetic interest in his sheep. I would like particularly to impress the latter. When we consider the additional comforts we enjoy from the returns of our flock, it is surely our part to see that they are not starving, perishing of thirst, or tortured with flies. The success and resultant prosperity of the New Zealand farmer is due to specialisation, and the New South Wales farmer must do likewise and give up the idea that anything is good enough and time spent on sheep is lost time.

With an over-production of wheat and an under-production of wool and lambs, the obvious thing is to concentrate on the latter. Practically the whole area of the wheat belt is suitable for fat lamb raising, the country being sweet and sound, and covered with fattening grasses and herbage in the winter and spring, during the period of the lambs' growth.

Selection of the Ewes.

The Merino ewe is suitable provided she is large and plain-bodied, but on no account must the small wrinkly type be bred from. The comeback ewe is preferable ; being a good mother, the lambs will grow more quickly and be of a better shape than from the Merino ewe. My preference, however, is for the first-cross ewe, which, when mated with the longwool or Down ram, will give the ideal freezing lamb weighing from 34 to 40 lb., in from sixteen to twenty weeks. These ewes will lamb about a month later than the Merino ewe, but the suckers will be ready for market at the same time, of greater weight, and more shapely freezers. These three types will yield a profitable fleece, and I would strongly advise not breeding from anything coarser than the first-cross ewe, otherwise the wool will not be so profitable, and the ewe will lamb altogether too late to permit of the sucker being marketed before the grass seed and the hot dry weather set in. Select one class of ewe ; then the lamb will be of an even type and more attractive to the buyer, either in the paddock or at the sale yards.

Selection of the Sire.

The importance of the selection of the sire cannot be stressed too much, and the motto should be, one quality only—the best. In the past, farmers have bred from any nondescript, thinking they would do for crossbreeding, but that is altogether a mistaken idea. Having decided on the choice of the longwool ram, then go to one of the recognised breeders, taking into consideration quality rather than cheapness.

In the milder climates and on the highlands, where the lamb can be given more time, the Romney is very suitable ; but in the drier, more extensive area of the wheat belt, where the great essential is early maturity, then the Border Leicester ram is the most valuable. After experimenting for four years with the Romney, Lincoln, English Leicester, Shropshire, and South Down, I have since 1915 used only the Border Leicester sire. Two strains of this blood—that is, the Merino x Border Leicester ewe, mated again with the Border Leicester ram—will give the ideal, quick-maturing lamb, and I have marketed the suckers at the age of sixteen weeks.

The Border Leicester ram is a thick-fleshed, early-maturing sheep, and when crossed with the Merino (which is thin-fleshed and slow-maturing) the offspring is a quick-maturing sheep with a better quality of mutton than the sire and a greater quantity of it than the dam. Being active, high-spirited, and with a sound constitution, he imparts these qualities to the progeny. Moreover, although he has a heavy carcase of mutton, he carries it on fine bones, and hence when crossed with smaller ewes there is less risk of loss during parturition than is likely to result if strong-boned, coarse-headed rams are used. I may be pardoned for my enthusiasm as regards the Border Leicester, perhaps; in my case "he's the gentleman that pays the rent."

Dipping.

From four to six weeks after shearing the ewes must be dipped. This is an absolute necessity, and I cannot understand any sheep-owner being so blind to his own interests as to neglect it, especially as the cost is so nominal. It makes for healthy sheep and for an improvement in the wool clip, and at the critical time in the autumn, during the lambing season, the ewes will not be troubled with lice.

Mating.

With Merino ewes the longwool ram should be joined on the first of November, and with crossbred ewes about a month later On the attention given the flock during this period will depend very largely the success or otherwise of the year's operations, because if the lambs are too late it may mean unmarketable suckers. The inclination of the longwool is to mate during the cool weather; this, however, can be overcome, though not without the use of judgment and time. Many failures in the past have come through the longwool ram being simply turned into the paddock and no further trouble taken. It is a good plan to turn one or two rams in early, selecting those that you may have noticed in the previous season are good travellers, and keeping in reserve about a third of the rams, to be joined later; any lame rams or any that have lost condition can then be taken out and spelled for a time.

At least 2 per cent. rams should be used, and preferably one extra to every 200 ewes, thus ensuring a quick lambing. During this period the flock should be yarded over-night at least once a week, and, if possible, kept in small paddocks. Should any of the rams loaf by themselves and show no inclinato follow the flock, it is a good plan to collect and yard them in the morning, and later in the afternoon to give each a dose of two or three packets of epsom salts dissolved in water and let them stay in the yard overnight with the ewes. This treatment has seldom to be repeated, as the longwools hate starvation, and evidently have no liking for the tonic. At this period of the year the grass is usually dry, and bulk epsom salts should be added to the salt lick.

Crutching.

During the autumn crutching is the next work, and this can be left until near the lambing unless flies are troublesome. See that the wool is trimmed from around the udder, thus giving the tiny lamb a better chance of finding the teat, and the result will be a 5 to 10 per cent. better average.

Lambing.

Constant attention must be given the ewes during the lambing season, and it is here that the man who has not time will fail badly, as the ride round the paddock once a week (Sunday mornings usually) will disclose losses which do not appear much until the results are finalised. A 5 per cent. loss of ewes and 10 to 20 per cent. loss of lambs will make a big difference to the year's returns. Personally, I give the whole of my time to the flock during this period, and the value of ewes and lambs saved gives me a wage of at least £20 per week.

Early morning is the most important time, and one has to arrive early to be ahead of the crow. With fat crossbreds it is usual to find on the camp ewes that have lain with their back on a slight incline downhill and are unable to rise; a helping hand and the ewe is saved. Again, there may be ewes in trouble, and in the majority of cases the life of ewe and lamb can be saved. At the end of the day one knows where the flock will camp, and should the weather conditions look unpromising it is practicable to give them a turn towards a sheltered camping ground. By constant attention one knows what damage is caused by crows and foxes, and measures can be taken to deal with them.

All carcases should be regularly collected and burnt. The crow will take the heaviest toll on twin lambs born during the day, the ewe not being able to defend the first lamb. With comeback and crossbred ewes properly cared for, at least a 90 per cent lambing should result, there being usually a considerable number of twins. In 1918, from 1,000 crossbred ewes, my percentage was 110, and the total loss of ewes 10; in 1922 the percentage was 100, and the loss of ewes 5.

On no account should dogs be allowed in the paddock before and during lambing. The ewes become much quieter in their absence, and after a few days it is possible to move through the ewes without at all disturbing them. Merino ewes are more timid than the crossbred.

Marking.

This should be done at intervals of about three weeks. the crossbred suckers carry so much fat that it is a great mistake to allow them to grow to any size, as this means a decided check. Every care should be taken to have clean instruments, disinfectants, and preferably clean yards, the lamb being let go on the outside of the yard. The whole operation of yarding, catching, and marking should be carefully done, and a small yard only should be used for the catching. The lamb should be carefully lifted from the ground, and not, as is usual, grabbed by the legs.

Colonel Stafford, lecturer in Veterinary Science at Lincoln College, New Zealand, in a recent lecture, said that it would surprise most people to learn that from 10 to 15 per cent. of the rejects at the meatworks were from big joints and torn muscles of the hindquarters, brought about by the practice of catching the young lamb by the hind leg and causing a wrench before the bones were properly set.

From now the ewe and the lamb should have the best that the farm can provide, and a good salt lick should be kept in the troughs.

Marketing.

The last and certainly not the least important operation is the marketing of the sucker, at an age of from 4 to 5 months. The great aim is to avoid loss of bloom, and I would prefer marketing a shade on the small side than a heavier lamb that has become dry. If handy to the trucking yards the lamb can be drafted early the morning of loading, a few ewes being taken with them if possible to the yards.

The chief considerations are to leave the lamb as long as possible with the mother, and on no account to overdrive.

"Beechmore" is 9 miles from the siding, so the lambs have to be started on the Monday morning and taken to the yards or a handy paddock. They have to be loaded by 2 p.m. on Tuesday and are sold at Homebush on the Thursday, so it is imperative that the lambs be not tired, hungry, or thirsty when loaded. As the lambs have to be marketed in at least two drafts, I yard on the Sunday afternoon, take out those for market, and turn the rest of the flock into a paddock close handy. After a short time the ewes will begin to drift back; they can be let into the yard, and by morning nearly all the mothers will be collected. Just before time of loading the drafting can be done at the yards, and the lambs will go into the trucks fresh and full. The ewes can be started for home and will reach there the same evening, so that really the extra labour involved does not amount to much, while the added returns will be anything from one to two shillings per head—which is surely quite worth while. Anyone with experience of trucking will have noticed over-driven lambs, too tired even to stand in the trucks, simply lying about with heads curled back on their shoulders. Yet the owners wonder why results are disappointing and losses occur on the journey.

From 1915 to 1923, during which period only second-cross Border Leicesters were bred, the net returns per lamb have averaged over £1, which should dispel any doubts as to fat lambs being a paying proposition. The following reports, entirely unsolicited, from my selling agents may prove of interest:—

1915—" Lambs arrived in good order. For quality and condition your lambs were fine freezers and speak well for your country."

1916-1919—Lambs sold in paddock.

1920—" As your lambs were of good quality and good weights they were an attractive lot."

1921—" Your lambs were of exceptionally nice quality."

1922—" The lambs you consigned appeared to advantage, being thick, full, sappy, and prime, and of excellent quality."

1923—" Lambs sold at 32s. 4d."

Messrs. Fraser Bros., soldier settlers of Mickibri, near Parkes, topped the market during November with their small consignment, averaging 28s. 7d.

As an example of results in a larger way, Mr. John Hogan, Gum Swamp Station, Jerilderie, sold in the Melbourne fat stock markets consignments of Border Leicester cross suckers totalling 4,000 and averaging 32s. 1d.

My results were obtained during a series of the driest years on record for our locality, situated about midway between Parkes, Peak Hill, and Trundle, and should prove that fat lambs suitable for export can be raised in the wheat belt of New South Wales and over a very extensive area. The lambs were fattened on the natural grasses and herbage, with odd paddocks thrown out of cultivation, and in two drought years were topped up on failing crops. The Chief Inspector of Agriculture estimates that there are 13 million acres in the wheat belt of New South Wales within 12 miles of existing railways, besides which there are considerable areas of the highlands, suitable for lamb-raising. Both Bathurst and Goulburn districts this season marketed a number of prime Romney cross lambs. Yet New South Wales, with this extensive suitable area and a total of 35,000,000 sheep, only exports 500,000 lambs in a good year, and in a bad year practically none. New Zealand, with 18,000,000 sheep, exports about 5,000,000 lambs annually. In 1920, and again in 1923, New South Wales lost each year over 2,000,000 sheep. What a different commercial proposition it would be if we were exporting that number of lambs and cutting out the sheep losses.

When we consider that Queensland, South and West Australia export very few lambs, and Victoria about 1,000,000 annually, what wonderful prospects there are for New South Wales with such an extensive area suitable, if only our wheat farmers and graziers would grasp the opportunity. All the experts agree that there is scarcely any possibility of overproduction. The world's sheep flocks have decreased 80,000,000 since 1915, and the demand is increasing each year for baby beef and lamb.

The Hon. Wm. Angliss, Melbourne, writes me as follows:—

> "I consider there is a tremendous opportunity for the farmers of this country to provide a good freezing lamb at a very profitable price. As far as one can judge, prices should continue to be highly satisfactory, and for some time to come you should be quite safe in breeding fat lambs for freezing, as the supply will hardly equal the demand.
>
> "Personally I am stocking up any country we have to its fullest capacity with a view of lambs and wool."

In Alabama, one of the greatest cotton-growing States in America, where cotton only had been grown until the advent of the boll weevil, it was found that more money could be made by growing other crops, with the result that at Enterprise City the farmers have erected a beautiful monument, in the shape of a water fountain, inscribed "In profound appreciation of the Boll Weevil and what it has done as the Herald of Prosperity."

If our wheat farmers would take heed and embrace the opportunity of combining wheat with fat lamb raising no monument would be needed, as the prosperity would be reflected in their homes and country towns.

WHAT NEW ZEALAND TEACHES US.

Mr. J. B. Cramsie's Address.

Following Mr. Clatworthy's paper, the President of the Conference, Mr. W. E. Tayler, called upon Mr. J. B. Cramsie, Chairman of the Australian Meat Council, to move a vote of thanks to Mr. Clatworthy.

Mr. Cramsie said he felt it an honor to have been invited to speak on the subject of fat lamb raising on such an occasion. It was a matter to which he had given considerable attention in the past five years, and after having studied in the early part of the year the methods which were being applied to fat lamb raising in New Zealand, and the conditions under which the industry there was being carried out, he had come to the conclusion that, as far as the production of fat lambs was concerned, this State had not given the matter the serious consideration it required.

He was deeply interested, first, as Deputy-Chairman of the Metropolitan Meat Industry Board of this State, to see an increase in the number of lambs for export, as an increased volume of business meant an opportunity of lowering the charges made for the work. Again, it was part of the programme of the Australian Meat Council that they should have an increased and improved production of all classes of stock, and it was the duty of the State Meat Advisory Board, which formed a portion of the Australian Meat Council, to conduct a propaganda urging the extension of this profitable industry in the districts of the State which were most suitable to it. As a producer himself, too, he was keenly interested in seeing the industry made successful. He could not imagine any successful closer settlement of New South Wales without increased lamb production being, in some way, part of the programme.

In New Zealand the areas were particularly small, and over fully three-fourths of the Dominion fat lamb raising was carried on in a very profitable manner. During his recent visit he had the opportunity, with the assistance of numerous friends engaged in the pastoral industry, of motoring over a large portion of the North Island, and through the famous Canterbury district of the South Island. He visited many of the stud breeders, many of whom were raising fat lambs, and he found their whole idea was to produce that class of lamb which would market on the other side of the world.

Their first care was the production of the proper class of ewe as a basis for their successful operations, and the ewe which was giving the best results was either the Romney Marsh x Leicester or the Romney Marsh x Lincoln cross. With these crossbred ewes were mated South Down rams, with the result that, running on English grasses, 60 per cent. of the lambs were sent to the killing and freezing works at four months with an average weight of 36 to 40 lb. The ewes, with the balance of the lambs, were then generally turned into a

paddock of rape, and within a month or six weeks the whole of the lambs were marketed in prime condition. It was estimated by the average farmer that he should secure a return of 100 per cent. of lambs.

He had the opportunity of visiting the famous Lincoln Agricultural College Farm in the North Canterbury district. This was not a State farm, but it had been created by the bequests of several New Zealand residents for the education and training of students of agriculture and stock raising. The farm comprised an area of some 900 acres, a large area of which was under English grasses, and the balance under crops of lucerne, rape, kale, turnips, and oats. It carried some 3,000 sheep, and large numbers of lambs were turned off annually for the meat works, their quality being very highly spoken of by those connected with the trade.

The working of this farm showed what could be done by the careful selection of stock and the proper feeding and fattening of lambs, and was an education to the surrounding settlers as to the best methods of carrying out this very important work.

The price paid to the producer in the North Island was from 9d. to 9¼d. per lb. In other words, for a lamb that dressed 36 lb. the owner was paid 27s, which gave him a profitable return for his labours. In the Canterbury district, where it is stated that the finest lambs are produced, the price paid at the Addington yards, which he visited, was 10d. per lb., and the lambs that were offered during his visit were estimated to average from 38 lb. to 40 lb., killed weight.

The carrying capacity of the various districts of New Zealand had been greatly increased by the planting of English grasses on most of the areas, and also by the growing of rape, lucerne, kale, and oats. By these means as high as 2½ ewes per acre had been carried on some of the best farms The value of land, as quoted to him by the various people of whom inquiries were made, was rated at £9 per ewe, which meant that country carrying two ewes per acre was worth £18 per acre.

In New Zealand they were particularly keen to secure the best class of ewe for lamb production, and the very best class of sire for the locality, and the results certainly justified the care taken.

Great care was also taken in handling the fat lambs from the time that they were dropped until they were sent to the meat works. So highly did the New Zealanders value their lambs, indeed, that recently they had been sending a fair number from the pastures to the works in double-decked motor lorries up to distances of 60 miles. They considered, in most cases where the lambs were situated some distance from the railway, or where they would have to be driven say four days by road, that there was a saving of equal to 1 lb. in the frozen weight if they were conveyed by motor lorry, and the consequent gain, after paying the extra freight of the motor waggons, was some 3d. to 4d. per lamb. A trial had recently been carried out for the New

Zealand Meat Producers' Board on this point, and Mr. Frank Wall, of Mahaki Station, Martinborough, in the North Island, had himself written Mr. Cramsie, relating the trial, as follows :—

> "I have this week conducted an experiment for the Meat Producers' Board. I took a small lot of 228 fat lambs and divided them into two lots of 114 each, one of which was sent to Waingawa and killed the same day, and the other lot dispatched by drover and killed four days later than the lorry lot.
>
> "The difference in weight only amounted to 1 lb. freezing weight, but there was a small cash gain of 3½d per head in favour of those sent by lorry.
>
> "I am to continue these experiments for the Board."

In lamb-raising, proximity to the trucking yards, first-class speedy train service, or proximity to the works was of extreme benefit. In New Zealand the meat works were scattered through the various districts, but it had been found that they had too many works at the present time, and last season some were not opened at all. There was a possibility of an arrangement being come to for a certain number of works to go out of operation in order to allow a greater volume of business for those remaining, and if this was done it would result in decreased overhead charges.

It had been found uneconomical to have too many works operating in a district where none of them could work to full capacity and obtain a lengthened run, and while such a large number of works were kept in operation it was extremely difficult to secure the specialised labour required to enable the slaughtering to be done in a first-class manner and the by-products to be handled efficiently.

The New South Wales Railway Commissioners had recently accelerated the speed of the stock trains, and the innovation had been of extreme benefit to the producers. From Parkes to Flemington the time of the journey of stock trains had been reduced from twenty-five hours to sixteen and a half, and one could imagine the improvement that eight and half hours less travelling meant to a fat lamb. Mr. Dowling, District Superintendent of Railways, was quite right in claiming credit for the Railway Commissioners for excellent work in accelerating the speed of stock trains. It was doubtful, however, if the change was an extra cost to the railways, as he believed it would be found in practice that the speeding up of the stock trains would enable very much more use to be made of both engines and trucks, and they would be able to haul more sheep than in the past, and to gain more revenue for the extra haulage. From the national point of view it was a wonderful gain, and it would enable the lamb-raising industry to be successfully extended in many districts which were too distant to be utilised for that purpose under the slow service conditions.

In many parts of Victoria and New South Wales fat lambs were produced that were equal to the best New Zealand lambs, and this accelerated train service would enable farmers to deliver lambs with a better bloom, and in

the future would give the same advantage to the outer areas as the inner areas had had in the past. It was speedy transit and careful handling alone which would enable them to keep those lambs so attractive, and if producers would only raise the best quality article, for which there was such a great demand in great Britain, speedy train services and up-to-date conveniences would enable Australia to make great strides, not only in the production of lamb, but towards securing the maximum prices ruling in the markets of the old world.

The statistics of the export of lambs from the whole of Australia compared with the number from New Zealand for the years 1913 to 1922 showed that New Zealand had certainly increased her exports and kept up a continuous supply in a very creditable way.

EXPORTS of Lamb.

Year	Australia.		New Zealand.	
1913	1,458,000	carcases.	3,423,000	carcases.
1914	1,600,000	,,	3,564,000	,,
1915	1,402,000	,,	3,662,000	,,
1916	400,000	,,	2,997,000	,,
1917	594,000	,,	1,347,000	,,
1918	15,000	,,	1,641,000	,,
1919	484,000	,,	2,633,000	,,
1920	1,441,000	,,	1,927,000	,,
1921	719,000	,,	4,942,000	,,
1922	1 843,000	,,	4,792,000	,,

Continuity of supply meant higher prices, because the produce was then kept well before purchasers in the world's markets. It was also necessary for the supply to be available over as long a period of the year as possible, so that the demand could be cultivated and catered for.

There were many districts in New South Wales which he felt certain were suitable for fat lamb raising, but in order to be sure of that he had consulted Mr. Hinton, Sheep and Wool Expert of the Department of Agriculture, and he had replied that while there were many districts suitable in the State, in his opinion two were specially suitable for lamb-raising. They were :—

1. An area of land starting on the Northern Line at Scone and extending as far north as Woolbrook, as far west as Breeza, and as far east as Nundle.

2. A very much larger area with the northern boundary at Wellington, the southern boundary at Howlong, the western boundary as West Wyalong, and the eastern boundary at Binalong.

Mr. Hinton had selected these areas on account of the land and the climatic conditions, and because the lambs had not to be conveyed over very great distances to Homebush.

Turning to the class of sheep suitable for the purpose Mr. Cramsie said he considered the dual-purpose sheep probably one of the best means of extending, in the early stages, the raising of fat lambs. He was inclined to think that an extension in the direction of the Corriedales in certain areas would be of great advantage to the closer settlers.

One factor which struck him as particularly noticeable in New Zealand was that all stock, whether sheep or cattle, were particularly quiet, and although many of the cattle were of a dairy cross, when he had the opportunity of inspecting a number of carcases at the various meat works he found among them some very fine ones from dairy cattle, between three and four years old, weighing from 720 to 750 lb., and showing excellent quality meat. These cattle had been run on English grasses practically from the time they were dropped, and as the result of that and of their being properly quietened, the carcases were nicely fattened and well grown.

Producers would have to recognise that a greater volume of business meant greater economy in handling. At the State Abattoirs at Homebush Bay for instance, they could handle another million sheep per annum comfortably without having to make any charge on them for extra overhead expenses. The same interest, the same administration, and the same upkeep had to be charged whether two million sheep or three million sheep were put through, and if the expenses could be distributed over the larger number the expense per head would be much less.

Only recently when Mr. L. F. Swift, chairman of directors of Messrs. Swift & Co., the great American meat packers, was in Australia, he asked how it would be possible to provide a load for his company's works on the Brisbane River. Mr. Cramsie's reply was that it would be quite easy if he could induce the farmers of the Darling Downs to produce between them a quarter of a million sheep per annum. It seemed clear to him that if the necessary financial assistance was afforded these farmers, and they were properly educated as to the class of fat lamb required, they would very soon be producing that number per annum, and if the necessary advance was made (by the packing firm, for instance) on the understanding that the works were to have the option of purchase of these lambs when they were ready at ruling market rates, there would soon be a load for the works which would turn the equipment into a profitable investment.

He was convinced that in establishing works in small centres it was first necessary to establish the volume of trade. The works could soon be erected, but the unfortunate part was that in the past works were established without any provision being made in the shape of artificial feeding, fodder conservation, &c., to ensure a continuous volume of work. Consequently the works had in most instances languished and died.

The whole question was bound up with the insurance of supplies of fodder. Last year in New South Wales 2,500,000 sheep and 400,000 cattle were allowed to die. "It is not worth breeding them if we are going to let them die," said Mr. Cramsie. The New Zealanders knew the value of their sheep and took care that none should die because of lack of feed.

Special attention should be directed to the fact that it was necessary for great care to be taken in the handling of fat lambs, both in droving or in loading at the railway station. The use of a pointed stick, or gripping the lamb by the wool meant a bruised and rejected carcase at the freezing works.

The New South Wales State Meat Advisory Board, with the assistance of the Railway Commissioners, had posted at the various trucking yards a request to truckers not to use pointed sticks or dogs, as it had been found that a very large number of lambs were rejected through being badly treated at the trucking yards. The lamb carcase was a particularly delicate one, and if it was subjected to any ill-treatment it was not allowed to be exported, and became a partial loss to the exporter.

He would strongly urge that favourable consideration be given to mixed farming in a district like Parkes, and to the increased and improved production of lambs He felt certain that there were many districts in New South Wales where it was possible to produce fat lambs of equal quality to those produced in New Zealand, and if they only took this matter up seriously there was no reason to believe that our export of lamb could not be increased by at least one million carcases per annum. It was the only way, he believed, in which successful closer settlement could be carried out.

Any one who had had experience on the land recognised that it was extremely difficult for the small settler to rear Merino sheep successfully. The small numbers of his flock were against him, and at times he found it difficult to dispose of the progeny just when it was necessary to do so On the other hand, with reasonable care and the use of proper breeds for the production of fat lambs, the small settler could rely on his lambs getting off to market each year and realising a payable sum in cash. Again, the crossbred sheep worked in much better with mixed farming, and so much care need not be taken of the wool, the principal object being to raise a perfect quality lamb which would ensure a profitable return. This would enable farmers to keep up a continuous supply of New South Wales lamb on the markets of the world, a factor that was essential to the establishment and maintenance of an Australian brand on the market.

If they could only establish a continuity of supply it meant a reduction of meat works charges, a reduction of freight in shipping, an established brand on the other side of the world, and prosperity to the whole of the Commonwealth

Seconding the vote of thanks to Mr. Clatworthy, Mr. W. R. Glasson, Molong, said it had been most informative to hear such a paper as that of Mr. Clatworthy and such a speech as that of Mr. Cramsie, and he congratulated the Conference delegates on the importance and significance of the occasion. He himself had been growing fat lambs since 1916, and could confirm what had been said as to the comparative values of crossbreds and Merinos for the purpose. Devoting one farm near Molong to crossbreds and another in a different but not distant district to Merinos, he had received more money for the lambs from the former than for those from the latter property. He could offer confirmation, too, as to the suitability of New South Wales country for the industry. A New Zealand buyer who bought lambs from

him in the paddock at Molong had told him that he could not have bought on the first draft such a large proportion of fats out of any drop of lambs in New Zealand—an encouraging assurance for all western growers.

Mr. G. B. Holt, Molong, who had also had experience in fat lamb raising, regarded the central western district as highly favoured in relation to the industry and in having such exponents of its value. Evidently farmers had to realise that unbroken development was essential. The loss of feed for even a few hours had a most serious effect upon a line of lambs—they lost freshness and bloom in a marked degree.

A memorable session of the Conference was brought to a close with an enthusiastic acceptance of Mr. Cramsie's proposal.

Treatment of Cotton Seed with Various Pastes.

Results of treating cotton seed with superphosphate paste for the purpose of getting rid of the "fuzz," which prevents it from running freely through the plate in the maize drill, were reported in this *Gazette* in January. Similar experiments were recently carried out at Hawkesbury Agricultural College, pastes of superphosphate, gypsum, and agricultural lime being tested as adhesive agents, and the effect on the germination of the seed noted. As the cotton seed used for sowing the College plots had been treated with sulphuric acid, this treatment was also included in the trial so that a comparison could be made.

The superphosphate paste gave the best gumming effect, and set very hard on drying. The lime was fairly effective, but the gypsum had a tendency to powder when dry, and to shake out when the seed was handled, and when in the seed-box of the maize drill. By using a ten-hole plate ($\frac{8}{16}$ inch holes, $\frac{3}{8}$ inch thick), seed of all three treatments were worked through the drill, the seeds being dropped three and four at a time every 8 inches in the row. All the seed, however, had a tendency to hang together, and needed to be constantly stirred in the seed-box, the gypsum-treated lot being the worst. The effect of treating the seed with sulphuric acid was to burn off the fuzz, and the seed was then washed in clean water. For the sowing of this seed a 20-hole plate ($\frac{7}{16}$ inch holes, $\frac{3}{16}$ inch thick) was used. Seeds were dropped two or three at a time every 6 inches, and this was most satisfactory.

The results of the germination tests in the soil were as follows:—

Treated with gypsum paste	94 per cent.
Treated with sulphuric acid	93 ,,
Untreated..	88 ,,
Treated with agricultural lime	84 ,,
Treated with superphosphate paste	62 ,,

The seed treated with gypsum paste, that treated with sulphuric acid, and the untreated seed came up a day before the lots treated with lime and with superphosphate, which on coming up had a difficulty in shedding the old seed-coat. A number of the young plants from the seed treated with lime paste died off shortly after coming up.—M. J. E. Squire, Experimentalist.

Farmers' Experiment Plots.

WHEAT AND OAT EXPERIMENTS, 1923.

Western District (Dubbo Centre).

B. M. ARTHUR, Agricultural Instructor.

THE following farmers co-operated with the Department in conducting cereal experiments during 1923:—

A. H. Newton, Yarrandale, Armatree.
J. Parslow, "Kelvin Grove," Gilgandra.
A. B. Mason, "Hartwood," Narromine.
D. A. Rich, Curra Creek, Wellington.
S. Reilley, junior, Eurimbla, via Cumnock.
M. F. Dalton, "Duntryleague," Orange.

In spite of adverse conditions which prevailed in the western district during 1923, yields were obtained from all centres except Narromine, where the plots, after an excellent germination and promising early growth, utterly failed and were fed off.

The Season.

The season generally—following on from a year (1922) of almost universal total or partial failure of all cereal crops in the west around Wellington, Dubbo, Narromine, &c.—was anything but good. Practically no rain of any consequence, with the exception of 2 to 4 inches during December, 1922, was recorded from August, 1922, to May, 1923, a period of ten months, and the majority of seeding took place in a dry seed-bed. The December rains too, fell at an awkward time for the majority of farmers, who were busily engaged in harvesting whatever they could, and consequently it was impossible to work their fallows. Therefore, the fallows did not show up to particular advantage, especially as there was no moisture to pre-germinate weed seeds and fungus spores. Still, many instances were noted where fallows, which necessarily contained a little more moisture, stood to the crop in its time of need, and produced small returns where stubble sowings were total failures.

All plots were sown during May in dry seed-beds, and in most cases the seed did not germinate until the break of dry conditions early in June. Germination in all cases was good, and pickling with a bluestone solution of 1½ per cent., followed by immersion in limewater and thorough drying of the grain (done in March), did not seem to affect the seed unduly. One plot of Federation, treated by dusting with dry copper carbonate, was sown at Narromine, and gave an excellent and quick germination, and also seemed to

be thicker and better stooled than an adjoining plot treated with bluestone. Unfortunately the failure of these plots prevented any comparable results from being obtained.

Excellent falls of rain were experienced in all centres during a large number of days in June, and these precipitations, though light, were sufficient to ensure a good germination and a steady growth. But none of the rains recorded, especially on the western plains, were heavy enough or sufficient thoroughly to saturate the subsoil, which was, in most cases, bone dry. Further light showers during July and early August were sufficient to keep the crops growing slowly, but growth was not rapid owing to the coldness of the soil and atmosphere, due to the frequency of cold wet days.

Consequently it was not until mid-August, when a few warm days were experienced, that crops made any rapid growth, but as they were well established, and had stooled well, everything looked promising for good yields. Further good rains in early September, with the exception of the Narromine district, which missed them, enhanced the prospects, and farmers generally were optimistic. But Thursday, 20th September, proved fatal to a large majority of the crops. On that day a cyclone of terrific violence, accompanied by heat, was experienced, and healthy looking crops wilted and went down before it in an extraordinary manner. What little moisture there was in the soil was rapidly dried out during that day and several subsequent windy days by excessive evaporation and leaf transpiration, and as no further rain, except for isolated patchy thunderstorms, was recorded till 30th October, a very large percentage of the crops on the western slopes and plains were burnt off, and were too far gone to respond when rain did occur.

System of Rotation.

A three-year rotation consisting of wheat, oats, and winter fodders (sown early, fed off, and fallowed during August or September) is conducted in conjunction with most of the trials, but owing to the abnormally dry summers and autumns experienced in both 1922 and 1923, and the consequent impossibility of sowing the winter fodders sufficiently early to obtain some feed from them before ploughing the residue under, the rotations have been somewhat upset, and in one case (Eurimbla) the wheat plots were not sown on the area originally set apart for them.

Winter fodders were not sown last season at Wellington nor Eurimbla, but made fair growth at Armatree, Gilgandra, and Orange, though germination did not take place until June, although the seed was sown during April. Feeding-off to horses and cattle was carried out at each centre, and the residues were ploughed under during October and November.

Plant Diseases.

Fungus diseases of the wheat plant were not noticed to any extent. Bunt was not present in any of the plots, showing that the fungicide pickle used was efficient as a preventive. Flag smut was noticeable occasionally, also loose smut, but there was no foot-rot or take-all.

Cultural Details of Plots.

Armatree.—Red clay loam; previous crop, winter fodders, fed off, 1922; mouldboard-ploughed 7th August, 1922, turning under crop residue; disc-cultivated 28th March; springtoothed 3rd May, and sown 9th May, with 50 lb. graded seed and 55 lb. superphosphate per acre. Germination, which took place in June in all plots, was good, but heavy growths of wild mustard and shepherd's purse retarded rapid progress.

Early-maturing wheats showed to the best advantage, especially Canberra and Clarendon, while Marshall's No. 3 and Currawa, owing to late maturity, were almost a failure.

The oat plots failed owing to heavy weed growth on stubble land.

Gilgandra.—Red loam with occasional clay and black soil patches; previous crop, winter fodders, 1922, which were fed off and ploughed under on 16th October; springtoothed early in January and again at the end of that month, also on 8th May; sown 10th May after 48 points of rain, and harrowed after sowing; used 50 lb. seed and 50 lb superphosphate per acre. All varieties sown were very even in yield, though Canberra gave the best results.

The oat varieties were sown on land on which Sudan grass had been sown on 21st September, 1922, but failed to germinate owing to dry conditions. Further treatment of the land was similar to above. The oats were sown on 11th May. The early-maturing varieties gave good yields but Algerian failed.

Narromine.—Red sandy loam; new land; fallowed August, 1921; spring-toothed both ways 7th May, 1923; sown 14th May with 51 lb seed and 56 lb. superphosphate per acre. An excellent germination and a rapid early growth free of all weeds resulted, and the plots were most promising, but lack of rain from early August to late October, together with strong winds, caused a total failure.

Wellington.—Gray clay loam, inclined to set hard if in too fine a condition; previous crop, winter fodders, 1922; fed off and mouldboard-ploughed August, 1922; skim-ploughed end of December and again in March; sown 17th May with 55 lb. seed and 60 lb. superphosphate per acre; harrowed after sowing. Germination was very good though growth was slow, being retarded by a heavy crop of weeds which had an undue influence in lessening the yields of the Canberra and Wandilla plots. Beneficial rains during late October and early November gave considerable assistance to late maturing varieties, and Marshall's No. 3 and Federation showed out best.

The oat variety trial plots sown on stubble land were a failure on account of a heavy crop of rubbish, including black oats.

Eurimbla.—Fairly heavy chocolate loam; previous crop wheat, no manure, 1921; mouldboard-ploughed August, 1922; disc-cultivated March, 1923; springtoothed both ways April, and sown 4th May with 50 lb. seed wheat and oats and 56 lb. superphosphate per acre.

Germination was good throughout the wheat and oat plots, and steady growth was maintained. The ground was very clean and free from weed

growth. Beneficial rains early in November were of untold advantage to the later-maturing varieties, as this district, being in the hilly country, has a somewhat later season than the majority of the western slopes. Marshall's No. 3 and Warden in the wheats and Algerian in the oats produced excellent results, although other varieties of oats gave higher yields. A heavy wind-storm, just as Mulga and Quandong varieties were fit to strip, thrashed them of many bushels of grain.

Orange.—A hay trial of wheat and oat varieties was conducted. Soil, red to grey loam; previous crop, winter fodders, 1922, fed off; mouldboard-ploughed 27th January, harrowed 6th March, mouldboard-ploughed 22nd March, harrowed 23rd, and sown 27th March with 60 lb. seed and 60 lb. superphosphate per acre in a dry seed-bed.

Owing to the absence of moisture, general germination did not take place till June, and was patchy. From then on too much rain was experienced; patches were water-logged and drowned out, and generally the crop did not make any progress until September. The plot of Warren being in a low-lying area was most affected and gave poor returns. Mulga and Quandong oats grew quickly as soon as warm dry weather was experienced, and returned fair yields under the circumstances.

RAINFALL during Fallow and Growing Periods.

Month.	Armatree	Gilgandra.	Narromine.
During Fallow Period.			
	Points.	Points.	Points.
1922.			
August...	68	33	...
September	30	218	...
October	58	70	...
November	48	30	31
December	343	402	407
1923.			
January	Nil.	...	...
February	Nil.	...	13
March	84	67	50
April	Nil.	...	15
Total	631	820	516
During Growing Period.			
May	...	48	40
June	464	373	383
July	103	123	193
August...	40	57	64
September	214	204	32
*October	97	100	80
Total	918	905	792

* October rains were recorded on 30th and September rains early in that month.

RESULTS of Variety Trials (Grain and Hay).

Variety.	Grain Yields.								Hay Yields.			
	Armatree.		Gilgandra		Wellington.		Eurimbla.		Orange.			
	bus.	lb.	bus.	lb.	bus.	lb	bus.	lb.	ton	cwt.	qr.	lb.
Wheats—												
Canberra ...	10	25	20	33	12	29	20	51	...			
Federation	...		...		23	9	27	9	...			
Hard Federation	9	28	18	44	17	49	26	38	...			
Clarendon	10	20	18	22	...		...		...			
Gresley ...	7	53	18	6	...		23	6	0	18	0	1[illegible]
Florence ...	...		16	28	...		...		...			
Currawa ...	2	50	...		...		...		...			
Marshall's No. 3	3	9	18	5	26	42	29	26	...			
Waratah ...	...		...		18	37	...		...			
Wandilla ...	...		...		8	52	...		...			
Warden ..	...		...		...		29	44	...			
Baldry ...	...		17	27	...		...		...			
Cleveland	...		...		...		...		1	0	1	12
Warren ...	...		...		...		...		0	5	3	20
Oats—												
Algerian ...	...		Failed.		...		49	11	...			
Sunrise ...	...		22	14	...		40	18	1	7	0	12
Mulga ...	...		33	33	...		25	13	2	3	3	9
Myall ...	...		30	32	...		...		...		...	
Quandong	...		...		...		23	31	1	15	2	0
Yarran .	...		...		...		42	37	...			

Fertiliser Trials.

A manurial trial (with Canberra) was incorporated with the wheat experiments. It will be noticed that the application of superphosphate gave a payable increase in each case.

RESULTS of Fertiliser Trials.

—	Armatree.		Gilgandra		Wellington.	
Superphosphate per acre :—	55 lb.		50 lb.		60 lb.	
	bus	lb	bus.	lb.	bus.	lb.
Manured ..	10	25	20	33	12	29
No manure ..	6	41	18	6	8	5
Increase from manure ..	3	44	2	27	4	24

Southern Tableland.

R. N. MAKIN, Senior Agricultural Instructor.

Experiments were conducted in the Crookwell district with varieties of wheat and oats which it was thought would be found suitable and perhaps better than those which have for many years been grown by local farmers.

The need of farmers on the South Coast for seed of certain varieties of wheat and oats, the proximity of the Crookwell district to that part of the coast, and its suitability for the production of grain, especially of oats, added interest to the trials, as success in the production of such varieties would mean a saving in costs to both coastal and tableland farmers if direct trading could be brought about. The tests were carried out on the holdings of the following, to whom the Department is indebted for their whole-hearted co-operation :—

C. E. Prell, "Gundowringa," Crookwell,
J. Plumb, "Normanton," Crookwell.

The season proved a good one, following one of the worst that had been experienced for many years. The crops were sown on 26th April at "Normanton," and on 2nd May at "Gundowringa," and both were harvested in December. The rainfall in the period 1st April to 30th November was as follows :

April	44	September... ...	551
May	155	October	320
June	516	November... ...	192
July	523		——
August	157	Total	2461

The crops were drilled in—wheat at 80 lb. per acre, and oats at 60 lb. per acre. Superphosphate was applied at 80 lb per acre.

The chief difference between the two plots, and that which largely accounts for the difference in the returns, lies in the fact that the "Gundowringa' plots were sown on new land which had only recently been cleared, while those at "Normanton" were on old cultivation land which had been under crops—potatoes and oats—for many years. The soil in each place is derived from basalt. The distance between the two properties is about 10 miles.

The crops were not fed off, and received no special treatment.

The returns from each plot clearly show that the position of the different varieties, in point of yield, is nearly the same. For instance, Sunrise oats, which are not claimed to be a grain variety, holds a poor place in the oats section in each case. The same is true of Florence wheat, which is not suitable to the district, but which was specially tested, as seed is required by dairy-farmers on the South Coast for green fodder purposes.

The position held by Algerian oats, on both plots, is interesting, considering it is so largely grown in the district. It seems that the two new Algerian crossbreds, Guyra and Yarran, are improvements, but future tests must further demonstrate this. Farmers who have seen them growing on the plots and also handled the grain have been much impressed with them, and it may be hoped these varieties will keep up their yield, as there is no doubt Algerian is not entirely satisfactory under Southern Tableland conditions.

Myall and Mulga—selections from Sunrise—will eventually displace Sunrise, as they are showing better characters. The yield of Wilga and its

habit of growth stamp it as a useful oat. Owing to a very limited supply of seed it was only tried at "Gundowringa," and it needs testing under more trying conditions than those it met before anything definite can be said.

The need for extensive tests with oats in this district is apparent and should be met. However, future experiments should bring us returns which no doubt will lift oat-growing to a higher plane.

The wheat returns are also very good. Cleveland, which is generally recommended for sowing as a hay or grain variety, was disappointing, but probably in a more trying season it would hold a better position, especially if rust was prevalent. The past season was remarkable for the absence of rust. Bomen will not be sown in future; being a red wheat it is being discarded. Yandilla King is a popular variety in the district and can well be recommended, and also Marshall's No. 3.

The district is more suitable for oat growing, but possibly some varieties of barley will prove profitable if further experimental work is carried out. The district is a good one, and is worthy of considerable attention.

The yields per acre were as follows:—

OATS.

	Gundowringa.		*Normanton.*	
	bus.	lb.	bus.	lb.
Sunrise ...	65	16	37	20
Yarran.. .	73		44	
Myall	63		40	
Mulga .	69		48	28
Guyra	70		45	20
Algerian .	59		43	
Wilga	82	18	.	

WHEAT.

	Gundowringa.		*Normanton.*	
	bus.	lb.	bus.	lb.
Florence	22		15	45
Bomen	38		24	
Warden ..	30	58	23	20
Yandilla King..	25		24	
Marshall's No. 3	39	40	24	48
Cleveland ...	23	41	21	51

SILAGE AT TILBA.

"THE silage stored is a record this year. The crops were very heavy, and produced large quantities of grain. Hickory King is the most popular variety."—R. HOYER, Hon. Secretary, Central Tilba Branch of the Agricultural Bureau.

TO CONTROL CABBAGE MOTH.

To keep cabbage plants free of cabbage moth (*Plutella maculipennis*) persistent spraying in the seed-beds, and later in the field, with kerosene emulsion or tobacco wash is useful. Experiments at Bathurst Experiment Farm, however, have shown that "Georgia mixture" is the most satisfactory spray to use. To make this mixture add 2 lb. of arsenate of lead to 50 gallons of water, and to this solution add one-sixth of a pint of a solution made up of 1 lb. resin and ½ lb. fresh washing soda boiled in a quart of water until a clear brown liquid is obtained. This mixture can be sprayed up to within five weeks of using the vegetables.—W. B. GURNEY, Government Entomologist.

"The Grasses and Fodder Plants of New South Wales."

Readers of the *Agricultural Gazette* will be interested to learn that the valuable series of drawings, which appeared some years ago, illustrating grasses that commonly occur in New South Wales, has now been collected into one volume, and, together with a great deal of additional matter, is available in a book of 350 pages under the above title.

Live stock are going to play a greater part than ever, perhaps, in the development of this State in the near future, and the appearance of this book is therefore timely. On the coast and in the elevated and western areas the management of our pastures so as to conserve and encourage useful grasses and control worthless ones must receive increasing attention, and there is hardly a part of the State where fodder crops, as a means of ensuring good feed when pastures are backward and of conserving feed for periods of scarcity, will not have a practical importance.

This book meets both those conditions, copiously illustrating and describing the best grasses (and also the undesirable ones), and discussing such fodder crops as lucerne, sorghums, clovers, &c., in articles that run up to thirty pages.

The author, Mr. E. Breakwell, B.A., B.Sc., was for years Agrostologist in the Department of Agriculture, and the work reflects the extensive knowledge of grasses he acquired, especially on the practical side. His one-time assistant, Mr. J. N. Whittet, now Agrostologist, has been a generous contributor, especially to the fodder plants section.

Obtainable from the Government Printer, or from the Under-Secretary and Director, Department of Agriculture, Sydney. Price, 6s.; postage, 4d. extra.

Winter School for Farmers, 1924.

Arrangements have been made for the annual Winter School for farmers to be held at Hawkesbury Agricultural College from 24th June to 19th July next. The syllabus covers a comprehensive course of lectures and demonstrations on agriculture, horticulture, live stock, &c., and in addition, practical training is available in useful work connected with farm life, such as saddlery, engineering, blacksmithing, carpentry, &c.

To meet a popular demand, a special school will be held for those who desire to specialise in the subject of poultry-farming. All branches of the industry will be fully dealt with, and moreover, the students will be given an opportunity of studying such subjects in the general course as are likely to be of value to them.

Farmers and youths over 16 years of age who have been engaged in rural work for at least one year will be eligible for admission to the general course, and admission to the poultry course will be granted to persons of either sex over the age named who are engaged in poultry-farming.

Applications for both schools will close on 31st May, 1924.

The fee for either course, inclusive of board and lodging, will be £5 5s. Prospectus and full information may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Plant Breeding as a National Asset.

THREE INSTRUCTIVE GRAPHS.

J. P. SHELTON, M.Sc., B.Sc. Agric., Plant Breeder.

AT the British Empire Exhibition, now being held at Wembley, England, the capacity of Australia for primary production will be featured in many ways. The growth and development of the wheat-growing industry will be made a matter of interest from many different angles. The Federal capital district, Canberra, has a court in the Australian pavilion, and because of its unique character the exhibit should attract much attention. But besides being the site of the Federal capital, Canberra district has a claim to distinction as the home and centre of work—the laboratory, one might almost say—of William Farrer, the wheat breeder whose foresight, experiments, and patient work have been such potent factors in the development of wheat growing, not only in New South Wales, but throughout Australia. It was at his farm at Lambrigg, quite close to the Federal city, that Mr. Farrer conceived and initiated the experiments which indicated to him the lines of breeding upon which he proceeded to the development of varieties which to-day are household words in Australia, for from Lambrigg, the influence of his work radiated throughout the whole continent.

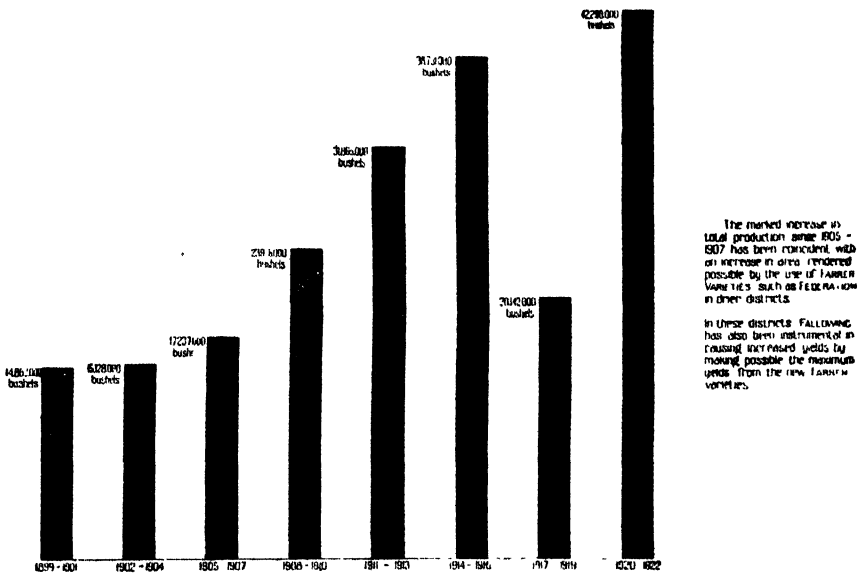
In order to feature the work of Farrer and his association with Canberra, three graphs have been drawn up on a large scale for exhibition on the walls of the Canberra court at Wembley, and are reproduced in the accompanying blocks. To some extent they illustrate the material results of Farrer's wheat-breeding work.

So many factors of an economic as well as an agricultural nature are necessarily involved in an increased production of any commodity such as wheat that it is often difficult to lay emphasis upon any. In the growth of the Australian wheat industry, however, two main factors have gone hand in hand: (1) the introduction of Farrer varieties, and (2) the adoption of proper methods of fallowing and soil management. In the notes attached to the graphs attention has been drawn to these inter-related factors.

The utmost development of fallowing would not have enabled wheat production with pre-Farrer varieties to become a commercial enterprise in the districts in New South Wales which have been the main centres of production in the last fifteen years. On the other hand, fallowing has made possible the harvesting of much higher yields from the new Farrer varieties than older methods would have allowed.

The first graph shows the total production of wheat in New South Wales during the period 1899 to 1922. Each column represents the average yearly production for the three years mentioned beneath. By taking the average of

three years, many of the fluctuations due to seasonal conditions have been eliminated, and a more accurate representation of the development of the industry has been obtained. The main Farrer varieties, such as Bunyip, Rymer, Federation, and Yandilla King, began to come into general use about 1906 to 1908, and by 1912 had largely replaced the old Purple Straw types. The graph indicates a remarkable and steady increase in total wheat production in New South Wales from the year 1907. Unfortunately no data are available as to the actual areas planted with the different varieties, but to those who are familiar with the widespread adoption of the new varieties during the period 1907 to 1912, there can be no doubt that the increasing production and the increasing use of Farrer varieties were very closely correlated.



PRODUCTION OF WHEAT IN NEW SOUTH WALES 1899-1922

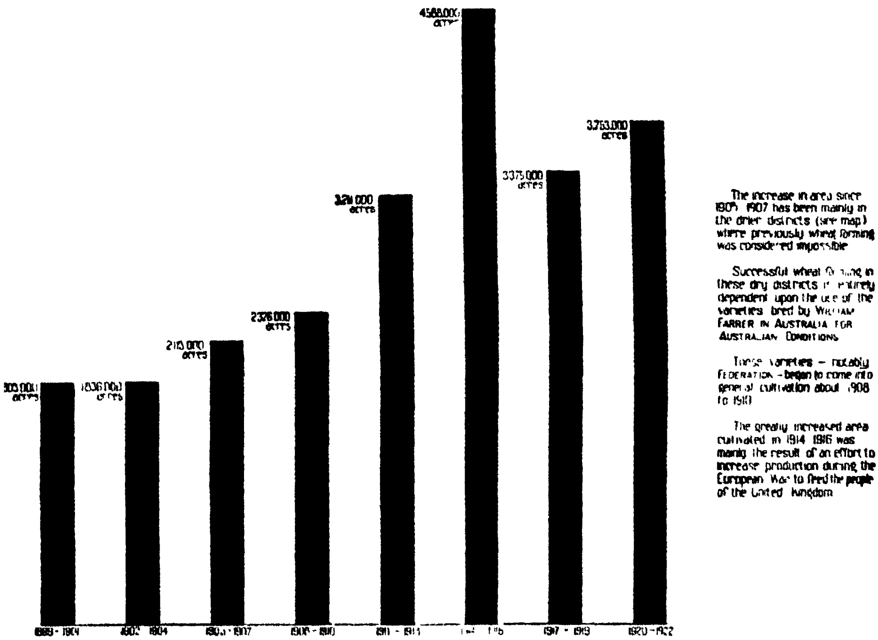
Each column represents the average production of the triennial period named

Farrer conducted wheat breeding near Canberra the Federal Capital

Graph No. 1.

The marked drop in production shown in the second last column for the period 1917 to 1919 inclusive, is due almost entirely to the run of bad seasons experienced in those years. The area under cultivation had declined considerably compared with the previous triennial period 1914 to 1916, as is shown in the second graph, but was still greater than in the 1911 to 1913 period. The total production declined, however, in far greater proportion than the area under cultivation, There are seasons in Australia, as in all countries, when climatic conditions of various kinds become an absolute limit to crop production, superimposing themselves upon such factors as improved varieties and up-to-date methods of farming.

Increased production is the sum of two factors—increased area and increased yield on areas already under cultivation. The introduction of Farrer varieties has been responsible for increases in both directions. The second graph shows the area under wheat for all purposes in New South Wales from 1899 to 1922, each column representing the annual average for the same periods of three years as in the respective column of the first graph. There has been a steady increase in area since about 1907. The increase has been fairly regular, except for the remarkable peak reached in 1914 to 1916, which was due almost entirely to the desire for increased production for war purposes during 1915 and 1916. This was fostered by the bonus



AREA UNDER WHEAT FOR ALL PURPOSES. NEW SOUTH WALES 1899-1922

Each column represents the average area of the three years of the triennial period stated

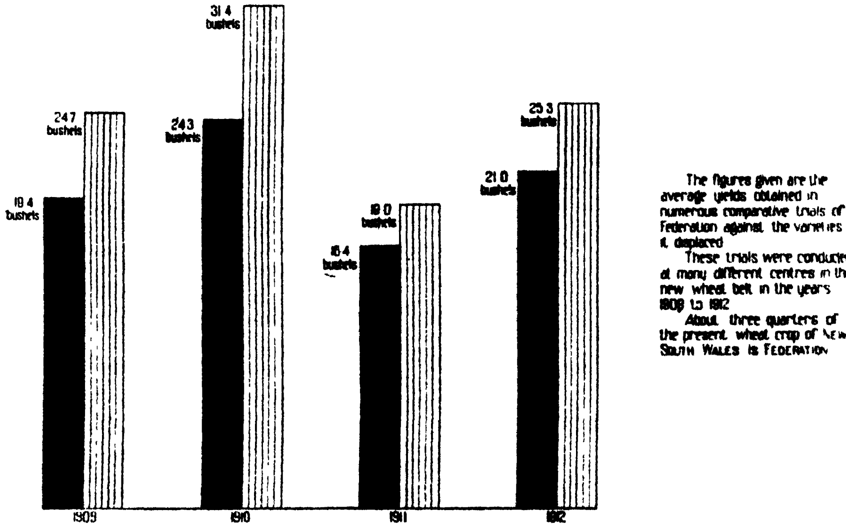
Farrer conducted wheat breeding near Canberra – the Federal Capital

Graph No. 2.

paid by the Government for new land brought under the plough, before it was realised that difficulties of transport rendered increased production in Australia almost useless for war purposes The graph should be studied in conjunction with the map published in the *Agricultural Gazette* in January, 1924, in which the vast territory where commercial wheat production has been found possible was shown. Without doubt such an extension of the wheat experience line westward, as is indicated on that map, has only been possible because the varieties grown have been Farrer varieties, or have been produced since Farrer's time with his varieties as a basis for the breeding work. Without the improved early-maturing and drought-resisting varieties

now available to farmers, that wide expanse on the western slopes and plains would have remained a pastoral country, and would carry but a small percentage of the population it now supports.

The second factor in increased production—higher yield per acre in areas already cultivated—is to some extent illustrated in the third graph. A comparison is there made of the average acre-yield of a number of pre-Farrer varieties of the old Purple Straw types, with the average yield of Federation, the most



INCREASED YIELD OF VARIETIES BRED BY WILLIAM FARRER FOR AUSTRALIAN CONDITIONS

Average Yield of Pre-Farrer Varieties

Average Yield of Federation the most prolific Farrer Wheat

Farrer conducted wheat breeding near Canberra - the Federal Capital -

Graph No. 3.

prolific and widely grown Farrer variety. The data are culled from a number of experiments carried out by the Department of Agriculture in conjunction with farmers in all parts of New South Wales in the years 1909 to 1912. These trials were conducted in districts where wheat growing was an established industry at the time, so that the results show the increased yield obtained from Federation under conditions where its competitors were able to produce their best yields. Federation invariably yielded considerably higher—5·3 bushels in 1909; 7·1 bushels in 1910; 2·6 bushels in 1911; and 4·3 bushels in 1912.

To many people in England, the graphs should form an interesting exhibit, not only because they indicate some of the factors underlying the increased wealth and prosperity of this part of the Empire; but also because they show why Australia has been able to rise from its position in 1896 and 1897 of a non-exporting wheat country, to a producer at the present time of about one-sixth of the wheat required by those wheat-importing countries of the world, which, like England, depend upon wheat grown overseas for the daily loaf.

Lamb-raising Trials, Season 1923.

E. A. ELLIOTT, Sheep and Wool Instructor.

Cowra Experiment Farm.

THE trials reported hereunder comprised a repetition of those carried out last year (see *Gazette*, April, 1923), except that this season the South Down was not included. Although departmental trials have shown the South Down to be an excellent lamb as regards shape and class of mutton, its smaller carcase and somewhat slower maturing qualities place it at a disadvantage when compared with the other two breeds in the tests.

On 9th January, 1923, 240 Border Leicester x Merino and Lincoln x Merino ewes were divided into two equal lots and mated, two Dorset Horn rams being joined with one lot and two Ryeland rams with the other lot. Owing to the season being rather dry, and the rams not appearing to work at once, the mating period was longer than usual; the rams were removed on 3rd March. Before being mixed, each lot of ewes was marked with a distinguishing brand.

During the mating period and up till May, there was sufficient natural pasture and stubble to keep the ewes in good condition, but during the month mentioned the pastures cut out and it was found necessary to hand-feed a ration consisting (per head) of 1 lb. wheaten chaff and ½-lb. wheat damped with molasses water each morning, and 1 lb. silage in the afternoon. Lucerne hay grown on the farm was substituted during July and was fed at the rate of 2 lb. per head per day. At the end of July a crop of oats which was being grown for hay was fed off for ten days, after which the sheep had access to 15 acres of Skinless barley, in addition to the natural pastures, until the marketing of the lambs.

Lambing continued from 15th June to the end of July, and on account of the unfavourable pastoral conditions the two lots of ewes were not separated. The lambs were marked two months later. The following table gives particulars of the lambing :—

Breed of lamb.	No. of ewes mated.	Ewes died at lambing.	Lambs died at birth.	No. of twins.	Lambs marked.	Per-centage.	Deaths after marking.
Dorset Horn cross ..	120	4	24	8	98	81·6	1
Ryeland cross	120	8		14	115	95·8	...

Of the ewes that died during lambing, it was noticed that almost every one was carrying twin lambs. One set of triplets was born in the Ryeland group.

It was noticed at marking time that the female lambs were in the majority. With the Dorset Horn cross, the proportion was 54 to 44; with the Ryeland cross, 67 to 48.

It will be noticed that twenty-four lambs died at birth. Most of these deaths occurred during a wet cold snap about the middle of July, but as both lots of ewes were running together, the breeding of these lambs could not be ascertained.

At marking time, and at intervals of one month, each lot was weighed, with the following results:—

Breed of lamb.	Average weight 17th Aug.		Average weight 11th Sept.		Average weight 12th Oct.		Increase from first weighing.	
	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Dorset Horn cross	40·8	46·8	52·9	55·7	76	80	35·2	33·2
Ryeland cross ..	38·2	45·6	50	57·4	72·5	82	34·3	36 4

At the first weighing the lambs commenced to reap the benefit of the green feed. When weighed in September they were all in great condition. As was noticed last year, the Dorset Horn cross lambs were taller and more leggy, the Ryeland cross lambs being nuggety and solid. It will be seen that at this weighing the Ryeland cross wether lambs gave the heaviest average weight. At the third weighing (on 12th October) the Ryeland wether lambs were again the heaviest, and the Ryeland cross altogether looked more attractive than the lambs of the Dorset cross.

The lambs were marketed in two drafts, the first draft--fifty-two of each cross—being sold at Flemington on 1st November, the oldest lambs being then $4\frac{1}{2}$ months old. When inspected in the yards prior to the sale, the Dorset Horn cross looked the largest on account of their longer legs, but the Ryeland cross were very solid when handled. Both lots looked extremely well, and topped the market by over 4s. per head. The second draft was sold at Flemington on 20th November. The result of both sales is given hereunder:—

Breed of lamb	First Draft		Second Draft.		Average Price.
	No.	Average Price	No.	Average Price.	
		£ s. d.		£ s. d.	£ s. d.
Dorset Horn cross	52	1 7 1	44	1 5 4	1 6 3
Ryeland cross	52	1 8 4	63	1 6 4	1 7 4

At the sales the Ryeland cross came in for a lot of admiration on account of their conformation, especially their chest and back development. It was estimated by buyers that they would average between 38 lb. and 42 lb. dressed weight.

The wool clip sold during the year from the ewes in the experiment averaged 10s. 9½d. per head.

The following table shows the net return per ewe mated:—

Breed of Lamb.	Ewes Mated	Lambs Sold.	Average Price per Lamb.	Value of Lamb Unsold.	Ewes died at Lambing.	Value of Ewes per Head.	Total Value of Lambs.	Less Value of Ewes Died	Average Return per Ewe Mated.
			£ s. d.	s.			£ s. d.	£ s. d.	£ s. d.
Dorset Horn cross.	120	96	1 6 3	10	4	22s.	126 10 0	122 2 0	1 0 4
Ryeland	120	115	1 7 4		8	22s.	157 3 4	148 7 4	1 4 8½

Bathurst Experiment Farm.

As at Cowra, the South Down was not included in the trials this season. The flock of first cross ewes (Lincoln-Merino) was equally divided, ninety-four ewes being mated to two Dorset Horn rams and ninety-four ewes to two Ryeland rams. The rams were joined on 8th January, 1923, and removed on 19th February, after which a distinguishing brand was put on each lot of ewes and they were allowed to run together.

The autumn was very dry and it became necessary to feed the ewes toward the end of April, a dozen bags of "white heads" being fed to them during this month. It is necessary at this farm to yard the sheep every night on account of town dogs, so feeding was done in bag troughs after the ewes were yarded in the evening. During May, wheat (soaked until soft in warm water) was given at the rate of ½ lb. per head per day. This was sufficient, with the roughage picked up during the day, to keep them in fairly strong condition. In June and July the wheat ration was increased to about ¾ lb. per head per day, and in addition was mixed with rough straw chaff, thirty bags of chaff being used in the two months. For a part of June the ewes had the run of the orchard (56 acres), where there was a fair amount of grass and fallen eaves. In August 1 lb. per head of wheat was given daily, and thirty bags of the straw chaff was given for the month. The winter was wet and cold, with the result that fodder crops made very slow growth, and it was not until early in September that they were sufficiently well grown to allow feeding off. From 4th September the ewes and lambs had access to a fodder crop of Algerian oats (45 acres) for about four hours daily.

The lambing did not commence, except for one lamb, until 22nd June, which was a fortnight after the due date. The weather during lambing was wet and cold, and a number of lambs died from exposure at birth. On account of hand-feeding and having to yard the ewes every night, the two lots were

not separated for lambing. No difficulty was experienced in finding the lambs of each cross, as the mothers were branded, and even without this precaution it would still have been possible, as, while the Dorset Horn cross lambs were rather tall and leggy from birth, the Ryeland cross lambs were much shorter in the legs and more nuggety in appearance.

Four ewes of each lot required assistance during lambing, and two of each lot died of parturition trouble. Owing to the severe weather experienced during the winter, eight ewes and seventeen lambs died. As the ewes were all six or seven years old, however, some losses were only to be expected in such an adverse season. The lambs were marked on 8th August. The following table gives details of the lambing:—

Breed of Lambs	Number of Ewes mated.	Ewes requiring assistance at lambing.	Ewes died at lambing.	Lambs died before marking.	Number of twins.	Lambs marked.	Percentage.	Deaths after marking.
Dorset Horn cross	94	4	2	5	6	86	91·5	1
Ryeland cross	94	4	2	12	6	70	74·5	1

At marking time and at intervals of one month each lot was weighed, with the following results:—

Breed of Lamb.	Average weight 29th Aug.		Average weight 26th Sept.		Average weight 22nd Oct.		Increase from first weighing.	
	Ewes	Wethers	Ewes.	Wethers	Ewes.	Wethers.	Ewes.	Wethers.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Dorset Horn cross ...	37	38	55·8	57·4	66·5	71 7	29·5	33·7
Ryeland cross	34·3	33·8	52 5	55·3	65	64·8	30·7	31

At the first weighing the lambs were not fat, but they looked fairly well considering the bad time they were going through. At the second weighing a great improvement could be noticed in the appearance of the lambs, both lots being well grown and shapely. The average increase in weight from the first to the second weighing was largely due to the fact that both groups had access to the fodder crop from 4th September onwards.

The remarks made in the report of the Cowra trials with regard to the appearance of the different crosses apply here also, the Dorset Horn cross being tall and leggy, and the Ryeland cross, on account of their short legs and nuggety appearance, were the more attractive.

On account of the severe conditions prevailing for the first two months after the birth of the lambs, and the slow progress of the pastures subsequently, the growth of the lambs was somewhat retarded in the earlier stages, and they

were not ready for market until early December. The lambs were marketed at Flemington in two drafts, the first on 6th December and the remainder a fortnight later. The following prices were realised :—

Breed of Lambs	First Draft		Second Draft.		Average Price.
	No.	Average Price.	No.	Average Price.	
		£ s. d.		£ s. d.	£ s. d.
Dorset Horn cross	32	1 11 4	53	1 10 4	1 10 8½
Ryeland cross	32	1 12 1	35	1 11 11½	1 12 0

The lambs in the first draft looked extremely well and were much admired. They topped the market for lambs for the day.

The following table shows the net return per ewe mated :—

Breed of Lamb.	Ewes mated.	Lambs sold.	Average price per lamb.	Value of lambs unsold.	Ewes died at lambing.	Value of ewes per head.	Total value of lambs	Less value of ewes died.	Average return per ewe mated.
			£ s. d.				£ s. d.	£ s. d.	£ s. d.
Dorset Horn cross.	94	85	1 10 8½	...	2	22s.	130 10 2½	128 6 2	1 7 3½
Ryeland cross	94	67	1 12 0	20s.	2		108 4 0	106 0 0	1 2 6½

The wool clip sold during the year from the ewes in the experiment averaged 9s. 9¼d. per head.

Summary of Return from Both Farms.

The total return per ewe mated, namely, 23s. 1¾d. for the Dorset Horn cross and 23s. 9d. for the Ryeland cross, illustrates very well the profitable nature of sheep-farming when lamb-raising is combined with agriculture.

State Conference of the Agricultural Bureau.

The second annual State Conference of the Agricultural Bureau will take place at Hawkesbury Agricultural College on 17th to 20th June. This important feature of the Bureau calendar promises to be full of interest for those attending. An attractive series of lectures is being arranged, a large number of motions have been set down for discussion, and wireless concerts will again be among the lighter features of the proceedings. Not least, of course, among the advantages held out to delegates will be the opportunity of viewing the many instructive sights offered by the College itself. A copy of the business paper will be sent to branches in due course.

Breeding Wheats Resistant to Flag Smut.

J. P. SHELTON, M.Sc., B.Sc.Agr., Plant Breeder.

THE breeding of varieties of wheat suitable for cultivation in the various districts of New South Wales, and immune from, or at least highly resistant to, flag smut (*Urocystis tritici*), is the simplest and most direct way of limiting the inroads which this serious disease is making in the wheat production of this State, and of preventing the heavy losses which individual farmers have suffered. The results given below are merely a record of the steps which have so far been taken in an attempt to breed such varieties.

That none of the varieties grown in the State is resistant to the disease has been indicated by the results of trials on farmers' plots and at departmental farms as well as by general field experience. It was therefore necessary to find a variety or strain which showed definite resistance to flag smut under local conditions. Although such variety might not—indeed probably would not—be adapted for cultivation in this State, it should be possible after crossing it with local types to isolate new varieties, which, while quite suitable for cultivation in New South Wales, would have the added character of resistance to flag smut.

Following an outbreak of flag smut in the United States of America in 1919, trials were undertaken at various centres in that country with a view to finding a resistant variety. In 1921 [1] several of the American winter wheat varieties were reported to possess quite marked resistance to the disease. These varieties are well known to be quite unsuitable for cultivation here, but they offered promising material for use in breeding work. Through the courtesy of Mr. W. L. Waterhouse, of the University of Sydney, small quantities of the seed of a number of such varieties were obtained in 1922 for immediate trial.

The seed was well dusted with fresh flag smut spores and sown in rows each containing fifty seeds, the grains being placed about five inches apart in the rows to enable individual plants to be examined. A single row of each variety was sown in each of two sowings, the first on 15th April and the second on 25th May, 1922. In both trials every alternate row was sown with inoculated seed of Cleveland wheat to furnish a standard for comparison. The test was carried out at Bathurst Experiment Farm. Cleveland is the standard variety at this farm and is very susceptible to flag smut. The number of flag-smutted plants in each row was counted shortly before harvest. The late-sown plot remained practically free from infection, both in the varieties under test as well as in the Cleveland check rows. This result is in accordance with the general experience that late sowing tends to minimise the disease.

The test was repeated at the Bathurst farm in 1923 under similar conditions, except that 100 seeds of a variety were sown in each row. Early

and late sowings were made on 10th May and 9th June respectively. The late-sown plot showed considerably more infection than did the late-sown. plot of 1922, but much less than the early-sown plot of 1923. Detailed results of the late-sown trials have not been included here, as they have no significance.

The results of the early-sown trials have been tabulated to show for each variety in each year, (1) the number of plants which grew, (2) the percentage of this number of plants which showed infection with flag smut, and (3) the average percentage of infected plants in the two adjacent check rows of Cleveland. The number of plants in each row of Cleveland is not shown, but the germination and growth of this variety were normal throughout. The American varieties did not germinate well, particularly in 1922, but the figures showing the total number of plants of each variety which grew give some indication of the significance of the test.

TRIALS of Imported Varieties of Wheat for Resistance to Flag Smut.

Variety.	1922. Sown 15th April			1923. Sown 10th May.		
	Number of plants.	Percentage of plants infected.	Average percentage of infection of two adjacent check rows.	Number of plants.	Percentage of plants infected.	Average percentage of infection of two adjacent check rows.
Galgalos	33	·0	40 8	63	0	46·4
Theiss	26	0	34·2	55	7·3	71·0
Imperial Amber	48	0	15·0	70	7·7	46 8
Mammoth Amber	10	·0	44·1	40	12·5	52·7
American Bronze	4	0	51·7	69	16·0	68·9
Red Rock	40	0	19 1	62	17·7	48 7
Indiana Swamp	38	19 4	7 3	60	18·3	64 5
Red May	31	6·5	18·1	56	21·4	46 0
Early Definace	14	17·1	4·7	63	25·4	68·3
Poole	36	11·1	16·2	78	29 5	60·3
Martin Amber	Failed	to germinate		5	40·0	43·0
Fulcaster	17	·0	15·8	67	59 7	45·1
Red Wave	Not	sown.		52	100 0	68·5

Of the varieties tried, all are of the winter type except Galgalos and Early Defiance, which are spring wheats, somewhat similar in growth habit to our local sorts. According to Clark. Martin and Ball[2], the variety Theiss is identical with Turkey Red.

The two years' results indicate that, while some of the varieties tried are apparently rather more resistant to flag smut than our New South Wales varieties, Galgalos is the only one of sufficient merit to warrant it being used as a resistant parent in breeding experiments. In 1923 this variety was crossed with Canberra, Cleveland, Federation, and Yandilla King, and material for an extensive breeding experiment is now on hand.

In 1923 Dr. R. J. Noble, of this Department, forwarded from the United States seed of fourteen additional varieties selected as being highly resistant to flag smut. Seed of these varieties inoculated with flag smut spores was

sown at Bathurst Experiment Farm last season in a trial to test resistance under local conditions. Unfortunately the sowing was late and practically no infection resulted. These varieties will be extensively tried during the coming season. One which is particularly promising has been crossed with five local sorts.

This report is published merely as a record of the trials, and as an indication of a promising line of work which has been undertaken by the Department. It should be emphasised that the varieties mentioned are not suitable for cultivation in New South Wales, and that no seed is available for distribution.

References Quoted.

[1] TISDALE, W. H., and GRIFFITHS, M. A.—"Flag Smut of Wheat and its Control"; Farmers' Bulletin No. 1213, U.S. Dept. Agr., 1921.

[2] CLARK, J. A., and others.—"Classification of American Wheat Varieties"; Bulletin No. 1074, U.S. Dept. Agr., 1922.

A MAIZE VARIETY TRIAL AT MOLONG.

A MAIZE variety trial was conducted recently in co-operation with Mr. J. A. Sullivan, "Gowan Brae," Wellington-road, Molong, Chairman of the Copper Hill branch of the Agricultural Bureau. The land offered by Mr. Sullivan and selected by the local farmers concerned as being typical of large areas in the district, and probably suitable for the production of maize for grain, is a deep volcanic red loam on sloping ground. The following varieties were sown:—Iowa Silvermine, Wellingrove, American Superb, Golden Glow, King of the Earlies, Kennedy, Funk's Yellow Dent, Early Morn, Parslow's Selected (local), Day's Selected (local).

The previous crop had been wheat in 1920 (no manure). The land was mouldboard-ploughed on 10th August 6 inches deep, harrowed 25th August, springtooth-cultivated 24th September, sown 18th October, and harrowed and cross-harrowed after sowing, which was done by hand in furrows 4 inches deep, opened up with a single furrow plough 4 feet apart. Three grains were dropped every 3 feet, without manure. The rows were covered in with light lever harrows.

Sufficient moisture was present at time of sowing to germinate the grain, and a fall of over an inch of rain immediately following ensured an excellent germination and a rapid early growth. Frequent showers up to Christmas made for steady growth and abundant suckering. A springtooth cultivation was given on 15th November and again on 20th December, and weeds were also hoed from around the plants.

Prospects appeared excellent, and all varieties grew to an average height of from 4 to 5 feet, but an absence of rain in the early part of the new year, coupled with strong winds at the critical stage of tasselling, prevented the plants from setting cobs. It was therefore decided to ensile the crop, which gave a net yield of 18 tons from the 3·3 acres, or an average of 5 tons 9 cwt. per acre. The weights of the varieties were not kept separate, but there was very little difference in their appearance. Rainfall records were not obtainable for the particular part of the district in which the trials were carried out, which missed most of the heavy rains that caused the floods in Molong during February.—B. M. ARTHUR, Agricultural Instructor.

Waters Suitable for Live Stock.

Analyses and Experiences in New South Wales.

A. A. RAMSAY, Chemist.

To graziers and farmers the question of water supplies for their stock is always a matter of importance, and from time to time large numbers of samples of water are sent to the Department with requests that they be analysed, and that the sender be informed as to their suitability for live stock. This has been going on for a number of years, until the waters that have been analysed have totalled several hundreds.

It was thought that valuable information probably underlay the experiences of stockowners who had used these waters, and a questionaire was therefore addressed to 185 of those who had sent samples of water in more recent years. Many farmers and station owners were good enough to respond, and the replies have been classified, and are tabulated below for the information and guidance of those interested.

It should be remarked that the information is merely the experiences of owners who have used those waters for their stock, and the Department would be glad to have the experiences of other graziers who have had waters analysed by the Department.

The opinions thus collected and presented should be regarded as somewhat tentative, although they will be of value as some indication of the amount of common salt, and of total solid matter which waters may contain with or without safety to farm stock. Any subsequent work on the suitability of waters for stock should relate to more careful and detailed observations concerning such circumstances as season, time of year, environment, and general health and condition of stock, both before and after the use of the water. The questions whether the stock had access to other water at the same time, whether they had lately been purchased and brought in from elsewhere, and how they were affected, should also receive attention.

In summarising the data collected, the amounts of common salt per gallon and the total solids per gallon are presented first, next the stockowners' comments, then the period the water was used—when it was stated—and, lastly, the district.

In connection with the headings, "Favourable Opinions," it should be explained that it was only possible to quote a few of the replies showing that the water was used with satisfactory results, but these are as far as possible representative of the bulk. In the cases of the headings, "Exceptions to Above Opinions" and "Unsuitable," all the replies have been quoted.

STOCK Waters for Horses.

Common Salt.	Total Solids.	Owners' Remarks.	Period Water Used.	District.
Grains per gallon.	Grains per gallon.	*Representative Favourable Opinions.*		
339	544	Horses do well ; no trouble	12 months ..	Moree.
441	722	Horses do fairly well	20 years .	Nowra.
559	952	,, ,, if not worked ..	6 years	Curlewis.
638	949	,, ,,	6 months .	Trundle.
798	1,022	,, ,, if not working..	3 months ..	Forbes.
		Exceptions to Above Opinions.		
392	565	Horses dislike water	....	Warren.
498	772	Horses would not eat after drinking this water.	. ...	Wagga.
765	987	Horses do not thrive, but lost condition.	... . ..	Menindie.
		Unsuitable for Horses.		
1,197	1,352	Horses refused to drink this water .	. ...	Narromine.
1,834	2,158	,, ,, ,, .	... .	West Wyalong.

From the above information it appears that horses do well on' water containing up to 400 grains common salt and up to 550 grains total solids, while they may be sustained, but not worked, on waters containing up to 638 grains of salt and up to 950 grains total solids per gallon. It is interesting to note that one station reports having used water containing 798 grains salt and 1,022 grains total solids for three months without trouble.

STOCK Waters for Cattle.

Common Salt.	Total Solids	Owners' Remarks.	Period Water Used.	District.
Grains per gallon.	Grains per gallon.	*Representative Favourable Opinions.*		
392	565	Cattle do well	9 years ...	Warren.
479	634	,, ,, ...	10 ,, ...	Mogo.
638	949	Cattle do well and improve	6 months ..	Trundle.
765	987	,, ,, and thrive	18 ,, ..	Menindie.
798	1,022	Cattle do well	3 ,, ...	Forbes.
798	1,136	,, ,, ...	2 years .	Morriset.
		Exceptions to the Above Opinions.		
498	636	Cattle lost condition	3 months	The Rock.
604	858	Cattle did not relish	6 ,,	
		Unsuitable for Cattle.		
973	1,318	164 cattle died after drinking ...	..	Barellan.
1,277	1,868	6 out of 7 cattle died four hours after drinking.	..	Cobar.
1,834	2,158	Cattle refused to drink	...	West Wyalong.

Cattle may thus be expected to do well and thrive on water containing as much as approximately 800 grains salt, and 1,000 grains total solids, though one grazier reported that his cattle lost condition on water containing 500 grains

salt and 636 grains total solids, and another stated that his cattle did not relish water containing 604 grains salt and 858 grains total solids although it was used for six months.

The limit of tolerance indicated for cattle is somewhat under 970 grains salt and 1,300 grains total solids—for 164 cattle died after drinking this water, and at the greater concentration of 1,277 grains salt and 1,868 grains total solids per gallon, the cattle died four hours after drinking. Cattle refused to drink water containing 1,834 grains salt and 2,158 grains total solids

STOCK Waters for Sheep.

Common Salt.	Total Solids.	Owners' remarks	Period Water Used.	District.
Grains per gallon.	Grains per gallon.	*Representative Favourable Opinions.*		
613	834	Sheep do well	6 months ..	Narrandera.
765	987	,, ,, ...	18 ,, ..	Minindie.
798	1,022	,, ,, ...	3 ,, ...	Forbes.
1,197	1,352	Sheep do well; no trouble, though 2 per cent refused to drink.	6 ,,	Narromine.
		Exceptions to the Above Opinions.		
498	772	Twenty sheep died after drinking ..	...	Wagga
519	750	One week killed sheep	..	Condobolin.
604	858	Sheep take it indifferently	...	The Rock.
973	1,318	Sheep scoured badly	.....	Barellan
		Unsuitable for Sheep.		
1,134	1,673	Could not get sheep to drink the water	.....	Oakley.
1,204	2,324	,, ,, ,,	.....	Ashley.
1,277	1,868	800 out of 1,500 sheep died three days after drinking.	.....	Coban.
1,834	2,158	Sheep refused to drink; they would die beside trough.	..	West Wyalong.
1,834	2,520	A few sheep would drink: those that did died.	...	Jerilderie.

With stock water having a concentration up to 800 grains common salt and 1,022 grains total solids per gallon, sheep apparently do well, and in one case—except that a small percentage of the sheep refused the water—a concentration of 1,197 grains salt and 1,350 grains total solids was found satisfactory. There were a number of cases, however, of water within this concentration causing ill effects, as shown in the table.

At higher concentrations greater difficulty was experienced in getting the sheep to drink the water, and greater mortality followed where the animals did drink it. At West Wyalong, where analysis showed the water to contain 1,834 grains common salt and 2,158 grains total solids, the sheep refused to drink, and died beside the trough.

The limit of tolerance for sheep appears to be somewhere under 1,277 grains salt and 1,868 grains total solids, for at this concentration 800 out of 1,500 sheep died three days after drinking the water.

Summary.

From the data thus collected it would appear:—

(1) That horses will thrive on water containing 400 grains common salt and 550 grains total solids per gallon, and provided they are not worked may be sustained on water containing up to 638 grains salt and 950 grains total solids. Water containing as much as 798 grains salt and 1,022 grains total solids has been used for a period of three months without ill effects.

(2) That cattle will thrive on water containing 800 grains common salt and 1,000 grains total solids, but when the concentration reaches 970 grains salt and 1,300 grains total solids, they are injuriously affected.

(3) That sheep will thrive on water containing 800 grains common salt and 1,000 grains total solids, and will do well even up to 1,197 grains salt and 1,350 grains total solids. When the concentration reaches 1,277 grains common salt and 1,868 grains total solids the sheep are injuriously affected.

"Journal of the Red Poll Breed."

In the *Journal of the Red Poll Breed,* the first issue of which has just been published, farmers interested in that breed have a little periodical worthy of their attention. It is a 68-page quarterly of pocket size and the official organ of the Red Poll Cattle Society of Great Britain and Ireland, and it aims primarily at "bringing the breed even still more than at present into that public favour which its qualities so pre eminently deserve."—Published by the Red Poll Cattle Society of Great Britain and Ireland, Ipswich, England.

A New Edition of "Pruning."

A new edition of "Pruning"—a revised, enlarged, and more substantially bound form of this popular departmental publication—is now on sale. The eighth edition of "Pruning," by Mr. W. J. Allen, makes its appearance at an opportune time, and should soon be in demand. Comprising over 200 pages of copiously illustrated matter, it deals with its subject exhaustively, and conveys its teachings in the most simple and direct manner. Few of the Department's handbooks on farming subjects are so well established in public favour. Copies are obtainable from the Under-Secretary and Director, Department of Agriculture, for 3s. 3d., post free.

Another departmental publication of interest to orchardists is Farmers' Bulletin, No. 72, "Spraying." This also has been revised and enlarged, and made available at the cost of the previous edition, viz., 1s. 1d., post free.

A Disease Survey.

FOREWORD.

MAX HENRY, Chief Veterinary Surgeon.

It has often been felt that the knowledge concerning the geographical distribution of disease in New South Wales is very deficient. Such knowledge is the only sound basis on which investigation and control can be carried out. In most countries in which the livestock industries are of any importance, this question receives considerable attention, and it is hoped that as time goes on very complete knowledge of the geographical distribution of various diseases will be obtained.

The accompanying report by Mr. Belschner shows the conditions existing in the Canonba Pastures Protection District during 1922 and 1923. It will be evident to anyone concerned with disease conditions in this country, or any other countries, that the report indicates the stock in that district are normally in a very healthy condition.

Of the diseases dealt with, lice and ticks in sheep require no comment, as it is well-known that dipping is the only solution of this problem, but it is interesting to note that although not causing trouble, the pests referred to are present even in a district so far to the west.

The condition designated "swelled head in rams" is still very obscure.

The absence of hydatids, and the almost complete absence of tuberculosis in the cattle seen during the period, are very satisfactory, and it is evident that actinomycosis is also comparatively rare. Trefoil dermatitis may, of course, occur in any district in which there is a luxuriant growth of plants such as *Medicago denticulata*, and the best prevention is the provision of shelter.

CANONBA PASTURES PROTECTION DISTRICT, 1922-1923.

H. G. BELSCHNER, B.V.Sc., Government Veterinary Surgeon.

The Incidence of Lice and Ticks in Sheep.—During August and September, 1922, I visited as many holdings as possible during shearing operations, and took the opportunity of examining sheep in the pens and fleeces in the bins. As a result of these inspections I ascertained that lice were fairly general throughout the district, but, with certain exceptions, not in great numbers.

In addition to the common louse (*Trichodectes sphærocephalus*), another species (*Hæmatopinus pedalis*) was discovered. Only two sheep were affected, and those very badly. The wool was removed and burnt and the sheep hand-reated. Many sheep showing no signs of lice infestation were, on close

examination, found to have them. I could make no differentiation between crossbreds being more generally or heavily infested than Merinos. Both local and introduced sheep were affected.

Sheep ticks (*Melophagus ovinus*) were found in two flocks—newly introduced sheep only. Ticks do not appear to live long on sheep in this district.

During August, September, and October, 1923, close inspections were again carried out. Lice were found not to be as generally spread over the district as in the previous year. Several flocks along the Macquarie were found to be infested, adjoining the Coonamble Pastures Protection District. No lice were seen on the West Bogan country this year. The years 1922 and 1923 were drought years, although the drought broke temporarily in June, 1923, and there was good feed all along the Macquarie. One small mob of lice-infested sheep came from Bathurst.

Swelled Head in Rams.—This condition was prevalent around Warren in January to March, 1923. One station reported having lost 100 rams in three months. Young rams were generally affected, but a 4-tooth was reported this year. Saw a very typical case in Warren stock-yards in March. One manager reported having treated cases with hot flannels and hot fomentations with success.

In April, 1923, 100 cases occurred on one station in this district.

Mortality in Pregnant Ewes.—There was marked absence of mortality during 1922–23 from lambing troubles, but when pregnant ewes were brought on to scrub feed they commenced to die rapidly.

Onchocerciasis (Worm Nodules).—These do not appear to exist among cattle bred in Canonba District. At the local slaughter-yards thirty-two cattle slaughtered were examined, all negative.

Hydatids (Echinococcus Veterinorum).—The above cattle were examined for hydatids; all negative.

Actinomycosis.—Two cases were seen; jaw-bone affected.

Tuberculosis.—One case of tuberculosis, generalised, was seen in a Jersey cow slaughtered at local yards, out of 32 cattle examined.

Cancerous Eyes.—No cases were seen in cattle, but 12 horses were seen affected with papillomatous growths, mostly on the nictitating membrane.

Cancerous Ears in Sheep.—On almost every holding it was possible to see several cases of cancerous ears.

Trefoil dermatitis.—Following the rains and the subsequent growth of all herbage in 1923, trefoil dermatitis affecting the ears of sheep was noticed. On one holding near Nyngan 3,000 sheep were mustered, and 3 per cent. were found affected in different stages. This may not be true trefoil dermatitis. The ears commence to wither up at the tip and curl, and the part falls off. In some cases the entire ear is removed. Appears to me more like the result of ergot, but rye grass was not found growing in the locality.

I have seen the same condition in cattle in this district. One case in particular was that of a red calf four months old; both ears were affected to the same extent.

Tetanus.—In 1922 a case occurred in a horse at Trangie and another at Girilambone. In 1923 a case occurred at Nyngan. Some sixty to seventy lambs died following marking at a station near Nyngan. Old yards.

Ophthalmia.—Isolated cases occurred. The condition was seen in two dairy cows on different holdings. Nine cases were seen in horses.

Caseous lymphadenitis.—One aged ewe at Nyngan, lungs and pleura affected.

Foot Rot.—In 1922, contagious gangrenous foot-rot occurred among sheep during a dry spell, and following upon a drought. It was cleaned up with difficulty.

Balanitis.—Nil.

Cyanogenetic Plants.—Variations were found in the prussic acid content of *Heterodendron oleæfolium* and *Eremophila maculata.* Material was forwarded monthly for examination. The results showed a maximum amount of hydrocyanic acid to be present in the plants in March, April, and May, and then it declined again.

Pleuro-pneumonia contagiosa.—No outbreak occurred during 1922 1923. An outbreak occurred on a holding adjoining Canonba district, near Warren, last year.

Black Spot on Dried Orange Peel from China.

In November, 1920, a parcel of dried orange peel was submitted by the Imports and Exports Branch for examination. This peel was imported, it is understood, for use in Chinese restaurants. The examination of the material revealed the presence of typical spots, pycnidia and spores of *Phoma citricarpa*, McAlp. The fruit was grown in China, so the Officer-in-charge of Imports and Exports reports. This was interesting, as I knew of no record of this fungus occurring outside of Australia.

Subsequently, a paper on "Black Spot on Citrus Fruits caused by *Phoma citricarpa* McAlp.," by H. Atherton Lee, was available to the writer. Lee records[1] the disease as having been observed at Canton, Hong Kong, Swatow, Amoy, and Foochoo in China, and states that plant-quarantine inspectors at Nagasaki intercepted specimens which eminated from Shanghai Isolation and inoculation experiments carried out by Lee proved the pathogenicity of the fungus. He states that the fungus makes restricted growth on glucose agar + 1. Darnell-Smith,[2] on glucose agar + 10, obtained luxuriant growth.

No mention is made by Lee of spermatial-like bodies in culture or X spores, as Darnell-Smith has designated them. These bodies were repeatedly met with by the writer prior to or associated with the extrusion of the ordinary spores while subculturing the fungus over a number of years. The X spores are fully discussed by Darnell-Smith.

Atherton Lee states that Black Spot has not yet been observed in Japan, America, or the Philippines.—W. A. Birmingham, Assistant Biologist.

[1] *The Philippine Jour. Sc.*, Vol 17, No. 6, Dec., 1920, p. 635.
[2] *Proc. Linn. Soc. N.S.W.*, 1918, Vol. xliii, Pt. 4, 27th Nov.

Prolific Weeds.

W. F. BLAKELY, Botanical Assistant.

THE first three months of this year have been remarkable for the large number of weeds that have made their appearance, apparently for the first time, over large areas in different parts of the State. Many land-owners are fully aware of the fact that after a severe drought, new or seemingly new plants suddenly appear in abundance where they were formerly unnoticed, and also that many weeds, particularly the various kinds of thistles, have their cycles of productivity, which appear to coincide with the climatic conditions most favourable to their development and reproduction, and which thus enable them to establish themselves to the total exclusion of other plants at least for the time being. The most notable examples during the recent period referred to are worth mention.

Caltrops (*Tribulus terrestris*).

This trailing, somewhat medic-like plant, which was illustrated in the *Gazette* in May, 1910, has been very abundant this year. Mr. J. N. Whittet, Agrostologist, reports that it is knee-deep on ploughed alluvial flats not under crop, near Scone, and there are some thousands of acres of it in the Coonamble district, which is practically left untouched by stock. It has also been received at the Botanic Gardens from Cooma, Goonoo Goonoo, Singleton, Merriwa, and Parkes.

Although indigenous, it also occurs in Europe and Asia, and it is a well established alien in America. In California it is known as Puncture Vine and Groundbur. The burrs are said to puncture the tyres of automobiles; and on the recommendation of the Automobile Club it was proclaimed noxious for the State of California. In Mexico it is known as Burnut, and is looked upon as a pernicious weed, as the spines of the fruits, which are almost as sharp as tacks, penetrate the soles of shoes, and they are a constant menace to rubber tyres, besides causing much trouble to wool-growers. In South Africa it has been suspected of poisoning stock.

L. H. Pammel, in "Manual of Poisonous Plants," suggests that the American plant may contain saponin and should be looked upon with suspicion, as one exotic species is regarded as poisonous. So far it does not appear to have been suspected of poisoning stock in this country, but until we know more about its properties it is as well to regard it with suspicion, and every effort should be made to keep it under control. Where it is thick, it should be burnt off when dry enough, as the fire will destroy large numbers of the burrs.

It is proclaimed noxious within the municipality of Narrandera.

A spineless form is also found with the normal form, and its burrs are less harmful. There are at least nine other species in Australia, but their properties appear to be unknown.

Wild Heliotrope (*Helotropium europæum*).

This is a native plant, although occurring in Europe and other parts of the world.

It is a dark green, rather strong-smelling herb, with roundish, short leaves from ½ to 1 inch broad, and small white flowers arranged in short, one-sided spikes; it somewhat resembles the garden heliotrope, to which it is closely related. The European plant is said to contain a poisonous alkaloid, but the properties of the Australian plant have not yet been investigated, and it does not appear to have been suspected of causing injury to stock.

Mr. W. Burke, Binya, on the Temora-Griffith line, writes: "It is a troublesome weed in wheat paddocks lying fallow. It springs up after the December rains and will cover a whole paddock in a few days. It flowers when about three weeks old, which makes it hard to keep in check. It is rarely eaten by stock, though on very rare occasions sheep will nibble at it."

It has also been received from Barmedman, Junee, Gobarralong, Lockhart, Forbes, Dubbo, and Breeza. It is proclaimed a noxious weed within the Marthaguy Shire.

Californian Stink Weed (*Navarretia squarrosa*).

This is a small erect sticky plant, better known as *Gilia squarrosa*, 1 to 2 feet high, with small prickly leaves and very small blue flowers. It is an aggressive, non-poisonous weed and is usually rejected by all classes of stock, probably owing to its sticky nature and offensive smell. It has been sent in from Tumut, Bombala, Canberra, Wagga, Tooma, Queanbeyan, Gobarralong, and Oberon. At one time it was thought that it would confine itself to the southern districts of the State, but it has made its appearance at Borenore, near Orange, in the west, and at Tamworth in the north.

It is proclaimed noxious within the Gadara and Murray shires, and for the whole of Victoria.

Buffalo Burr (*Solanum rostratum*).

This weed was illustrated in the *Gazette* for June, 1904, and also in "Weeds of New South Wales," page 74.

This useless plant is rapidly spreading over many parts of the State. When ripe, its burr-like fruits, which contain numerous black seeds, become attached to grazing animals, and the seeds are thus distributed by them. Last year it was forwarded for identification from eight different districts. This year specimens were received from The Rock, West Wyalong, Boorowa, Stratford, Gunnedah, Scone, and Tenterfield.

It is proclaimed noxious within the shires of Apsley, Berrigan, and Hume.

St. Barnaby's Thistle (*Centaurea solstitialis*).

An illustration of this weed appeared in the *Gazette* for March, 1917, and also in "Weeds of New South Wales," page 118. In some parts of the State this weed is as common as its congener, *C. militensis*, Cockspur or Saucy Jack. It is, however, a more spiny plant with yellow flower heads, enveloped in longer spines, which are apt to penetrate the soft tissue of the mouths of stock and to cause abscesses. Judging from the rapid way it is spreading, it will be only a matter of time when it will have infested the whole of the wheat belt, and overrun many pastures as well.

Since December, it has been found to occur at Hay, Junee, Murrumburrah, Yass, Cowra, and Forbes. It is proclaimed noxious in the municipalities of Cootamundra and Tamworth, and in the Goobang shire.

Stinkwort (*Inula graveolens*).

This widespread noxious weed was illustrated in the *Gazette* for October, 1895, in the "Farmers' Handbook," 1922, page 817, and in "Weeds of New South Wales," page 88. It has now found its way into the wheat districts of Canberra, Binya, Mudgee, Mullaley, and Singleton. Sheep will keep a farm free of it without injury to themselves if they are kept constantly on it from the start, but if it is old and dry ewes and lambs especially may be affected.

It it proclaimed noxious by over fifty shires and municipalities throughout the State.

Stinking Roger (*Tagetes minuta*).

This tall, rank-smelling weed is very abundant on the Northern Rivers. It is a pest in all classes of agriculture, as well as along roads, railways, and vacant town lands. In some places it is much taller than the maize crops, and in rich land it reaches the height of nine feet. It has now made its appearance at Binya and Temora, thus indicating that it is working its way southwards.

It is a prohibited weed under the Federal Quarantine Act of 1908–1915, under the name of *T. glandulifera*, and it is proclaimed noxious within the Municipality of Picton.

Fertilisers and Strawberries.

It has been estimated by conservative investigators that two good crops of berries (strawberries), including the production of vine and fruit, will remove during the three years of growth of the crop at least 223 lb. or more of nitrogen, 83 lb. or more of phosphoric acid, and 375 lb. or more of potash per acre. . . . Some of the reasons it pays to fertilise strawberries are that it vastly increases the yield, gives larger berries, a better colour and flavour, and firmer fruit.—A. V. Amet, in *Better Fruit*.

The Queen Bee Competition at Wauchope.

W. A. GOODACRE, Senior Apicultural Instructor.

THE conduct of a queen bee competition involves the determination of the bees' qualifications under a number of different headings. All of the tests are of importance, and their results must all be taken into consideration in judging the quality of the bees, but the test of the honey-gathering capacity of the queen bees' progeny, as lately carried out with interesting results in the competition, is, no doubt, the one of most interest to bee-farmers generally, for any improvement in the quantity of honey stored means for him a correspondingly improved financial position. Variable results are to be found in colonies apparently equal in population and prospects, one storing in some cases twice as much surplus honey as another; others, again, as shown in the competition results, do not get to a surplus storing stage, and are unproductive. What would be the result of selecting a queen bee to breed from without first applying such tests? Quite likely the breeding stock used will ultimately prove unproductive, and show undesirable features in other qualifications, but by the introduction of the pure race of Italian bees the financial aspect of bee-farming is improved, and by selection in breeding we hope further to improve the pure race.

The honey-gathering qualification test just concluded at the Wauchope Apiary was rather a severe one, as drought conditions obtained during a good portion of the working season. The production was low, but the test was a conclusive one, for a colony that is capable of producing a fair surplus of honey and showing other good qualities clearly during a poor season is worthy of consideration for selection as stock to breed from.

The work of Mr. G. G. Phillips' queens, which came first in both the group and individual sections in the honey-gathering tests, is commendable, especially in the case of queen No. 16 which has also done well in other tests. No. 18 has also proved a queen of high standard.

Mr. L. Smart's colonies were doing very well, following their good work in building up, until Nos. 14 and 15 developed swarming ideas late in the season, which interfered with the production of honey.

Mr. Geo. James' queen No. 6 held a leading position in the individual test until the last few weeks of the active working season, when the queen was superseded by the bees. It was rather unfortunate that such a promising queen did not survive the remaining period An effort was made to delay the supersedure, but it was found that the bees were right in their ideas regarding the failing of the queen, and a young one was allowed to emerge to prevent further decline of the colony.

F. Coleman's colony No. 12 gave rather good results right through. E. J. Gibbs' colony No. 3 gave very good general results throughout,

and his No. 1 queen also showed some good qualities. The colonies with Cushan Bros.' queens, Nos. 7, 8, and 9, did not provide any surplus production.

The points awarded for honey-gathering qualities (maximum, 100) are as follows, each point representing one pound of surplus honey produced:—

G. G. Phillips.—No. 16, 85; No. 17, nil; No. 18, 51; total, 136 points.
L. Smart.—No. 13, 20; No. 14, 33; No. 15, 50; total, 103 points.
E. J. Gibbs.—No. 1, 25; No. 2, nil; No. 3, 60; total, 85 points.
Geo. James.—No. 4, nil; No. 5, nil; No. 6, 58; total, 58 points.
F. Coleman.—No. 10, nil; No. 11, nil; No. 12, 51; total, 51 points.
Cushan Bros.—No. 7, nil; No. 8, nil; No. 9, nil; no production.

Other tests have been concluded, and the results will be published in an early issue of the *Gazette*.

When Harvesting Sudan Grass Seed.

The ordinary harvester will handle Sudan grass seed provided the grass is not too tall, in which case it should be cut with the reaper and binder, stooked in the field, and threshed when dry. The seed is ripe for harvesting when it is fully formed and dry, and shells easily when rubbed between the hands. It may be necessary to cut off the blast if the seed is being blown over the end of the riddles. A good crop of Sudan grass will yield from 8 to 12 cwt. seed per acre.—J. N. Whittet, Agrostologist.

To Protect Tomatoes from Frost.

A correspondent who had about an acre of late tomatoes which he was anxious to protect from injury by frost, wished to know if the firing of little heaps of straw placed around the plot in the early morning when frost threatened should prove effective. Could the Department inform him what temperature would injure tomatoes, and how long before sunrise it would be advisable to light the fires? The reply was in the following terms:—

"Smoke screens have been successfully used in preventing excessive damage from frost. The success will largely depend on the situation of the plot in regard to air drainage, and whether it is possible to confine the smoke screen over the crop. On an exposed slope it may be difficult to do this—between hills the smoke provides a much surer protection. Straw should be suitable as fuel, but if dry would burn away too quickly. Any material such as twigs, &c., is suitable, but if some green material or tar is put on fires the amount of smoke produced will be increased.

"Tomatoes are not always destroyed at freezing temperature (32 deg. Fah.). A case has been recorded where no damage resulted until 29·8 deg. Fah. was reached. In a test carried out at Arlington Experiment Farm, Washington, United States of America, which included nineteen varieties, the average point at which damage resulted was 30·46 deg. Fah. The time for lighting the fires is best regulated by the thermometer. It is better to keep up the air temperature over the plot than to rely on the smoke screen as a protection against quick thawing. The heat given off by the fires should warm the air and may thus prevent freezing."—A. J. Pinn, Special Agricultural Instructor.

Clovers for the Apiarist.

TRIALS AT HAWKESBURY AGRICULTURAL COLLEGE.

J. N. WHITTET, Agrostologist.

FOR some time past the question whether certain clovers do or do not provide large quantities of nectar for bees has been widely discussed, and in order to throw some light on the matter a trial was conducted last season at the above institution.

The plots were situated just below the College apiary, in order that a close watch might be kept on the trial, and the varieties which were most favoured by the bees noted.

An area of half an acre was planted on 10th April, 1923, using the following varieties:—

Annual Bokhara or Sweet Clover (*Melilotus alba* var.).
Hubam (*Melilotus alba* var.).
Biennial Bokhara (*Melilotus alba*).
Cow-grass (*Trifolium pratense* var. *perenne*).
Perennial Red (*Trifolium pratense* var. *perenne*).
Crimson (*Trifolium incarnatum*).
Berseem or Egyptian (*Trifolium alexandrinum*).

The seed was sown thinly in drills which were 3 feet apart: superphosphate was applied at the rate of 1 cwt. per acre

The germination on all plots was fair, the rainfall during the period 10th April to 30th November being 15·47 inches. As the average annual rainfall at the College for many years is approximately 30 inches, the rainfall for the eight months was low.

Description of Varieties.

Annual Bokhara and Hubam clovers are selections from the biennial form. They are rapid-growing annuals, attaining in good localities and in good seasons heights of 6 to 7 feet. The plants have white flowers, and evidently secrete large quantities of nectar, as they are frequently visited by bees. Our experience is that there is no difference between Annual Bokhara and Hubam as regards habit of growth and probable nectar content, and as the former gives results as good as the latter, there is no necessity to pay the higher price usually charged for Hubam.

Biennial Bokhara is somewhat similar in its habit of growth to the annual forms, but does not make much headway during its first season. In consequence of this fact a good deal of honey and time would be lost if the biennial form were used in preference to the annual ones, as the former does not flower as profusely as either of the annuals in either its first or second year.

Annual Bokhara Clover.

Cow-grass clover is one of the perennial red strains. Like Perennial Red, it retains its vigour under cultivation for some years.

Crimson clover is an annual with a short period of growth. The colour of its flowers varies somewhat from crimson to cream, but the general colour is crimson.

Berseem or Egyptian clover is a fairly strong-growing annual. It is a rapid grower and has pale yellow cylindrical flowers.

Comparative Values of Different Varieties.

Mr. H. G. Smith, Apiarist at the College, made the following observations on this trial :—

"Annual Bokhara.—The bees work on this variety from morning till evening. It secretes honey freely and flowers at a favourable season for gathering same.

"Hubam.—Bees favour this variety in about the same measure as Annual Bokhara.

"Biennial Bokhara was not visited by bees to the same extent as the annual forms. At the time this variety flowered, conditions were very favourable for nectar secretion, and it does not appear to be of the same value to the apiarist as Annual Bokhara or Hubam which, even as late as 11th February, 1921, were still in blossom and secreting nectar freely.

"Cow-grass clover and Perennial Red —No bees were observed working on these varieties.

"Crimson clover and Berseem.—These are of little value as very few bees were seen at work on them."

Seed Treatment Beneficial.

In order to promote rapid and effective germination, it is often found necessary to lightly scarify the seed-coat of the various forms of Bokhara clover. Good results in this direction may be obtained by lightly rubbing the seed between sheets of fine sandpaper. If this work is not carried out, the large amount of "hard" seed present may not germinate, and a patchy crop will result.

It is evident that the annual forms of Bokhara clover are the most suitable clovers to grow for honey production.

A Preventive of Sheep Blow-fly.

For jetting sheep for prevention of blow fly, the best results have been obtained from a solution made up of 7 lb. arsenic and 5 lb. soda ash boiled in a 10-gallon vessel for one hour, and then made up by the addition of water to 100 gallons. This solution should be jetted into the breech of the sheep at a pressure of about 50 lb. For other parts of the animal the pressure should be varied, according to the growth of the wool, up to 100 or 120 lb.—Max Henry, Chief Veterinary Surgeon.

The County Agent System in the United States.

The functions of the county agent in the United States are varied indeed. A summary is presented in one of the numerous publications of the Department of Agriculture as follows:—"It is the duty of the county agent to bring to the farmers of his county on their own farms the results of scientific investigations in agriculture and the experience of successful farmers, and through demonstrations to influence the farmers to put these into practice. He assists in reorganising and redirecting the agriculture of the community, and assists all economic and social forces working for the improvement of agriculture and country life. He gives instruction not only in those subjects which are generally recognised under the head of improved agricultural practices, but also in farm management, marketing, and purchasing supplies. He carries on a great part of this instruction through farm demonstrations. In these demonstrations the farmer undertakes with his own labour, and entirely at his own expense, to grow some particular crop or livestock under the agent's supervision and direction."

The number of persons engaged in county agent work (as distinct from such other lines of extension service as home demonstration and boys' and girls' club work) is given as 2,433 for 1922. Funds for co-operative extension work are derived from four main sources—(1) the Federal Department, (2) the State, (3) the county, and (4) local bodies. The amount provided under the last-mentioned heading (membership fees from the Farm Bureau and donations by banks, philanthropists, &c.), appears to constitute only a small proportion of the total, nearly 95 per cent. of the money provided for agricultural extension work in 1922-23 coming out of public funds. Out of the total of 18,821,000 dollars allotted, the amount from Federal sources was 6,953,000 dollars, including 5,880,000 dollars contributed under the provisions of the Smith-Lever Act. The remaining 11,868,000 dollars was derived from sources within the various States, including 5,241,000 dollars appropriated by the State Legislatures and funds under the control of the State agricultural colleges, 5,654,000 dollars provided by the different counties, and 973,000 dollars from other sources, mostly local.—A. H. E. McDonald, Chief Inspector of Agriculture.

Chemical Aids to the Eradication of Weeds.

"Could you advise me of a good solution to kill sweet briar. I am at present grubbing out young briars, and it is very hard to get at all the roots. I thought you might inform me of a solution that could be sprayed on the ground to kill any future growth after the briars have been grubbed."

The writer of the foregoing was informed that numerous specifics have been tried with varying success for the eradication of briar and other useless vegetation, but their expense and their harmfulness to stock have been drawbacks to their use. Arsenic preparations have been largely used, and satisfactory formulæ are as follows:—(1) Sodium arsenite used at the rate of 1 lb. to 2 gallons water. (2) Arsenious acid (white arsenic) dissolved in water at the rate of 1 lb. per gallon, with the addition of either (*a*) ¼ lb. of caustic soda, or (*b*) ¾ lb. washing solution. When the arsenic is dissolved 2 gallons of water are added for use. The toxic character of these preparations, it may again be pointed out, necessitates caution in regard to stock.—A. A. Ramsay, Chemist.

The Importance of Bee-farming.

W. A. GOODACRE, Senior Apiary Instructor.

ANY advance made in the bee-farming industry does not result only in a greater production of honey. As the scientist Cheshire says, "Honey is but a fraction of the result of the bee's labour. They take to truly give, and flowers, seeds, and fruit follow in their train."

As the bee is the chief agent in fertilisation in plant life, the value of the industry from that point of view can hardly be over-estimated. With the days of closer settlement and with bush bees becoming scarce, more and more depends upon the hive bee for this fertilisation work, though that important aspect of the value of the industry is often overlooked. Where honey production may be valued at, say, a quarter of a million pounds, the full value of the bee's work may be set down at several millions.

This was amply demonstrated some years ago in Great Britain. When so many hive bees were lost through ravages of the "Isle of Wight disease," the greatest loss occurred in other branches of agriculture through imperfect fertilisation in plant life. As it is in the interest of the bee-farmer to encourage other branches of agriculture, so it is to the interest of other agriculturists to encourage bee-farming. Some knowledge of the bee's work would benefit the agriculturist generally, and some knowledge of plant life as bearing on agriculture would as certainly benefit the bee-farmer.

We may take for an instance, what Cheshire has to say about the apple: "The apple, as its blossom indicates, is, strictly, a fusion of five fruits into one--hence called pseudosyncarpous—and demands, for its production in perfection, no less than five independent fertilisations. If none is effected, the calyx, which really forms the flesh of the fruit, instead of swelling, dries and soon drops. An apple often develops, though imperfectly, if four only of the stigmas have been pollen dusted, but it rarely hangs long enough to ripen, the first severe storm sending it to the pigs as a windfall. I had two hundred apples that had dropped during a gale, gathered promiscuously for a lecture illustration, and the cause of falling, in every case but eight, was traceable to imperfect fertilisation. These fruits may be generally known by a deformity; one part has failed to grow, because there has been no diversion of nutrition towards it. Cutting it across with a knife, we find its hollow cheek lies opposite the unfertilised dissepiment containing only shrivelled pips."

In other branches of agriculture somewhat similar items of interest could be quoted, showing how much depends on perfect pollination in the production of seed, &c. Even in plants which provide to a large extent for pollen dusting by wind, the bees greatly assist. In their eagerness to obtain supplies of honey they scatter the pollen to be picked up in the right quarter by the plant for fertilisation purposes.

Girard says that "money thrown out of the window in encouraging apiculture will return by the door with heavy interest."

Where the general agriculturist can give the most encouragement to bee-farming is, at the present time, in the preservation of the honey flora. We often find that through lack of knowledge or thought, the trees, &c., reserved on a holding for shade, &c., are of very little use for bees, whereas with a little knowledge, trees that would have served the same purpose and also have been of importance in encouraging bee-farming could have been retained. There are many opportunities too, for reserving good trees on a holding where their growth would not interfere with the interests of the land-holder, and before letting out contracts for ring-barking this point should be considered.

The contention is often raised by the agriculturist when mention is made regarding the preservation of flora that the bee-farmer pays no rent for supplies gathered on the holding, but when we come to consider that the apiarist only gets a fraction of the result of the bee's work in many cases, a different aspect is evident. In spite of this fact bee-farmers would be quite willing to pay if some status were given them in the reservation of flight areas where good flora had been preserved.

Bee-farming in the United States of America has, I understand, made greater progress than any other primary industry during the past twenty years. It is considered that if all the honey for one season's production was loaded in freight cars, it would make a solid train load 50 miles long. They have there a Department of Bee Culture. We have splendid opportunities here for the advance of bee-farming, and the industry, considering its general importance, is deserving of every encouragement.

Weather Reports in Relation to Farming.

The Department is making its weather work pay back to the nation many hundred of dollars for each dollar expended. The forecasts issued twice daily for all sections of the country, and warnings of frosts, cold waves, storms, heavy snows, whenever conditions warrant (all of which are widely and effectively distributed through newspapers, by telephone, telegraph, radio, maps, bulletins, cards, and other means), meet general requirements, but the rapidly increasing utilisation of weather information by many business industries is resulting in requests for more special forecasts and direct service. In addition to the hundreds of thousands of receiving-set owners who receive the forecasts by radiophone, large numbers of whom can obtain them in no other way, many repeat them to their neighbours by telephone. This latter form of service has become so potential that arrangements are in hand for a definite form of organisation which will replace the telegraphing of forecast messages now sent to centres for distribution.—*Annual Report of the United States Secretary of Agriculture.*

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of James Hadlington, Poultry Expert.)

TWENTY-SECOND YEAR'S RESULTS, 1923-24.

F. H. HARVEY, Organising Secretary.

THE Twenty-second Egg-laying Competition at Hawkesbury Agricultural College commenced on 10th April, 1923, and terminated on 31st March, 1924. In this competition an innovation was made, inasmuch as in previous years the tests were commenced on 1st April in each year, whereas on this occasion the Committee of Management considered that better results might be secured by avoiding the practice of a double removal of the birds after arrival at the College, and that by delaying the opening of the competition until 10th April, an opportunity would be afforded of removing from the pens the birds from the last competition and allowing the new entrants to be placed direct into their pens. Thus the competition ran for a period of fifty-one weeks instead of fifty-two weeks as previously.

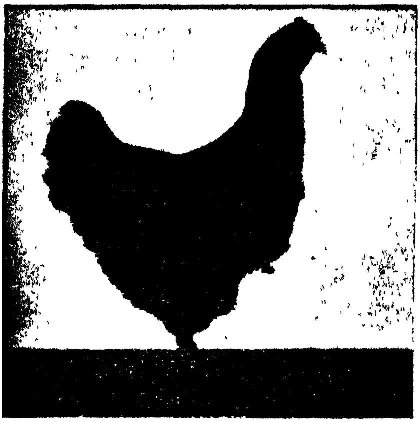
The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. James Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson, J. H. Madrers, and E. T. Rhodes (competitors' representatives), and F. H. Harvey (Department of Agriculture), Organising Secretary.

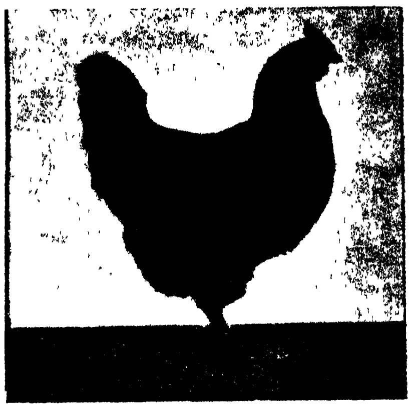
Scope of the Competition.

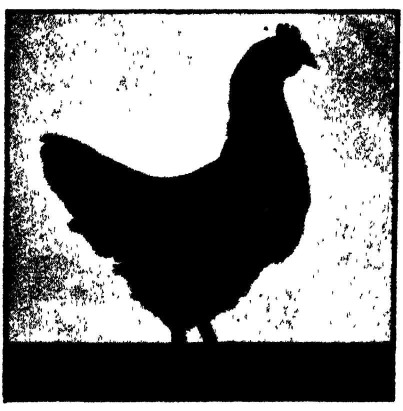
The competition embraced four sections, namely, open sections for light and heavy breeds, and standard sections for light and heavy breeds. This marks the fifth year in which competitions were provided for standard-bred birds, the qualification for entry in these sections being that the owner had won a first, second, or third prize with the particular breed entered in an "open show class" at an approved exhibition held in New South Wales during the previous three years.

The competitions were limited to pullets between 7 and 12 months old on 1st April, 1923, and pens were allotted as follows :—

	Groups.	Birds.
Section A.		
Open Light Breeds :—		
White Leghorns ...	50	300
Minorcas	...	...
Section B.		
Open Heavy Breeds :—		
Black Orpingtons ..	18	108
Langshans	9	54
Silver Wyandottes ...	1	6
Plymouth Rocks ..	1	6
Rhode Island Reds ..	1	6
Section C1.		
Standard Light Breeds :—		
White Leghorns ...	3	18
Minorcas	1	6
Brown Leghorns ...	1	6
Section C2.		
Standard Heavy Breeds :—		
Langshans	2	12
Rhode Island Reds ...	1	6
Silver Wyandottes ...	1	6
Black Orpingtons ...	1	6
Total	90	540







Three of Mr. A. R. Sinclair's Group of Langshans.

Winner of Grand Champion Prize for group of six birds laying eggs of greatest market value and of standard weight without replacement (1,476 eggs.)

Weight of Eggs.

The regulation that individual hens must lay eggs of at least 2 oz. each, and that eggs from groups must average at least 24 oz. per dozen within four months of the commencement of the competition in order to be eligible for prizes, resulted in the disqualification of seven individual hens, as follows:—

Disqualified from Individual Prizes.

Light Breeds.—Anderson Brothers (No. 192); R. G. Christie and Son (No. 246); W. J. Hill (No. 481); C. A. Clarke (No. 510).

Heavy Breeds.—A. George (No. 7); J. H. Madrers (No. 63); J. D. Martin (No. 168).

Disqualified from Group Prizes.

Heavy Breeds.—J. D. Martin.

Mortality and Disease.

The mortality for the year was somewhat lower than in the preceding year, being thirty, as compared with thirty-four. The details were:—

	1922-23.		1923-24.	
	Light Breeds.	Heavy Breeds.	Light Breeds.	Heavy Breeds.
Birds replaced	1	2	1	2
Birds not replaced	19	12	13	14

Prices of Eggs.

The prices of eggs, calculated to the nearest penny, from the account sales received at the College for sale of the competition eggs, were as follows:—

	Price per doz. s. d.		Price per doz. s. d.
April, 1923	2 4	October, 1923	1 2
May, ,, ...	2 8	November, ,, ...	1 4
June, ,, ...	2 3	December, ,, ...	1 7
July, ,, ...	1 9	January, 1924	1 6
August, ,, ...	1 5	February, ,, ..	1 11
September, ,, ...	1 2	March, ,, ...	2 1

The Financial Aspect.

The cost of feed for the 540 birds for the year was £261 4s. 4d., representing:—

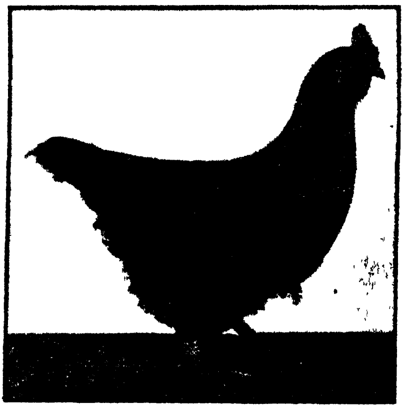
			£	s.	d.
Wheat	381 bushels	36 lb. ..	96	14	3
Maize	112 ,,	15 ,, ...	41	2	4
Pollard	735 ,,	4 ,, ...	66	11	8
Bran	361 ,,	12 ,, ...	31	18	11
Green feed	81 cwt.	108 ,, ...	4	2	0
Meat meal...	15 ,,	24 ,, ...	13	6	1
Common salt	280 lb.	5 oz. ...	1	1	11
Epsom salts	51 ,, ...	... ...	0	7	2
Shell grit	2½ tons...	... ...	6	0	0

The average cost of feed per head was thus 9s. 9d.

The market value of the eggs laid was £701 15s. 6d., so that the profit over cost of feed was £440 11s. 2d., equal to 16s. 4d. per head.

The Monthly Laying.

Month.		Section A. Open Light Breeds.		Section B. Open Heavy Breeds.		Section C1. Standard Light Breeds.		Section C2. Standard Heavy Breeds.	
		Total for 300 hens.	Average per hen.	Total for 180 hens.	Average per hen.	Total for 30 hens.	Average per hen.	Total for 30 hens.	Average per hen.
April,	1923 ...	2,111	7·0	1,799	10·0	157	5·2	309	10·3
May,	,, ..	4,192	14·0	3,297	18·3	366	12·2	595	19·8
June,	,, ..	4,928	16·4	3,623	20·1	412	13·7	594	19·8
July,	,, ...	5,246	17·5	3,493	19·4	434	14·5	593	19·8
August,	,, ...	5,994	20·0	3,755	20·8	445	14·8	632	21·0
September,	,, ...	6,681	22·3	4,045	22·5	628	20·9	659	22·0
October,	,, ...	7,156	23·8	3,679	20·5	626	20·9	567	18·9
November,	,, ..	6,489	21·6	3,126	17·4	552	18·4	513	17·1
December,	,, ..	6,073	20·2	2,658	14·8	463	15·4	425	14·2
January,	1924 ..	5,453	18·2	2,466	13·7	397	13·2	406	13·5
February,	,, ..	4,765	15·9	2,379	13·2	338	11·2	415	13·8
March,	,, ..	3,898	13·0	2,265	12·9	285	9·5	446	14·9
		62,987	209·69	36,585	203·3	5,103	170·1	6,154	205·1



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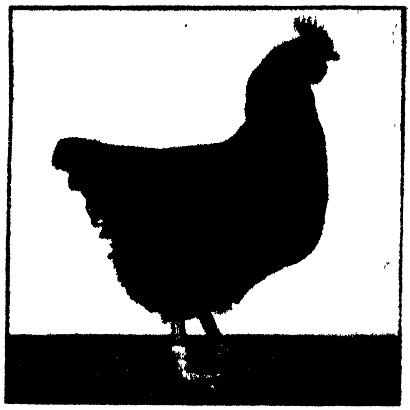
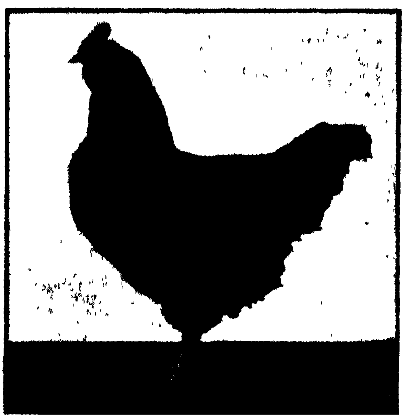




Three of Mr. A. George's group of Black Orpingtons.

Greatest number of eggs (1,600) in the Heavy Breeds Section.

A—This hen laid 307 eggs, securing the prize for greatest number of eggs laid by an individual hen in the Heavy Breeds Section.

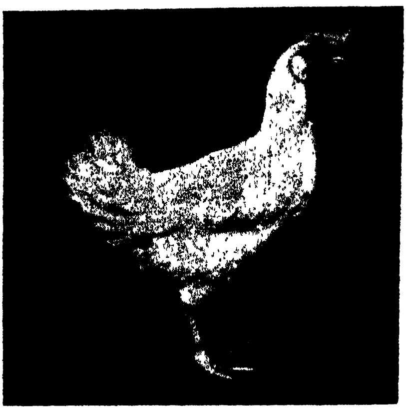
Annual Competition.

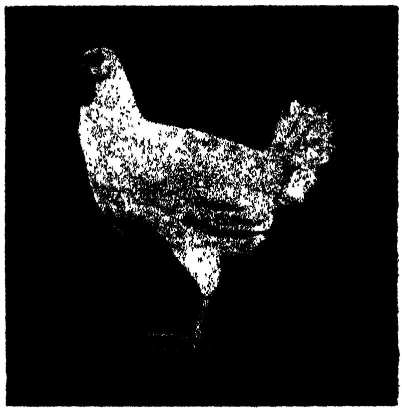
Full details of the financial and other results since the inception of the competitions are given in the following comparative table:—

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st ...		38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd ...		70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd ..		100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th ...		100	1,411	635	168	166	-/11½	13/3	5/3½	8/
5th ...		100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th		60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th ..		50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th ...		60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th ..		40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th ...		50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th ...		50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th ...		50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th ...		63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th ..		70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th	A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
	B	30	1,479	749	165	192	1/3¼	21/7½	6/10	14/9½
16th	A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
	B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
17th	A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
	B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
18th	A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
	B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
	C1	3	1,304	977	138	195	1/10	27/8	9/3	18/5
	C2	7	1,336	955	150	191	1/10	28/5	9/3	19/2
19th	A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
	B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
	C1	5	1,425	944	148	195	2/2	36/-	12/8	23/4
	C2	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
20th	A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
	B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
	C1	5	1,092	885	144	168	1/11	24/7	11/9	12/10
	C2	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
21st	A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
	B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
	C1	5	1,220	864	149	176	1/9	25/8	10/10	14/10
	C2	5	1,212	931	144	187	1/9	27/3	10/10	16/5
22nd	A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
	B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
	C1	5	1,307	692	142	170	1/6	21/1	9/9	11/4
	C2	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-

Averages of Breeds.

No. of Birds	Breed.	Eggs per Hen.	Weight of eggs per dozen.	Value per Hen.
	Open Light Breeds.		oz.	£ s. d.
300	White Leghorn	209	25½	1 6 3
	Open Heavy Breeds.			
108	Black Orpington	204	25⅓	1 6 2
54	Langshan	203	25½	1 6 2
6	Plymouth Rock	209	23¾	1 8 0
6	Silver Wyandotte	202	25¾	1 6 9
6	Rhode Island Red	186	24	1 4 10
	Standard Light Breeds.			
18	White Leghorn	171	26⅓	1 1 5
6	Brown Leghorn	184	24¾	1 2 8
6	Minorcas	165	25¼	0 18 4
	Standard Heavy Breeds.			
12	Langshan	217	26	1 9 4
6	Silver Wyandotte	206	24¼	1 7 3
6	Black Orpington	194	25	1 6 1
6	Barred Rock	175	24¼	1 1 11





Three of Mr. F. S. Longley's group of White Leghorns.

Greatest number of eggs (1,508) in the Light Breeds Section

Scores of Leading Birds.

The following table shows the monthly totals of the ten leading scores in the light and in the heavy breeds:—

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total.
Light Breeds.													
L. A. Ellis: White Leghorn	13	25	24	25	25	27	30	29	28	28	28	27	309
F. S. Longley: White Leghorn	14	27	25	21	25	28	29	28	28	25	26	28	307
Day Dawn Poultry Farm: White Leghorn.	6	24	23	25	26	26	31	28	26	26	22	23	286
Lewis & Stephens: White Leghorn . ..	17	27	25	24	27	28	26	27	21	27	25	11	285
F. S. Longley: White Leghorn	14	25	22	24	21	27	29	26	24	22	23	23	280
Watson & Stepney: White Leghorn..	11	21	23	25	24	25	27	26	26	23	23	23	277
F. S. Longley: White Leghorn ..	17	24	19	22	22	24	29	25	26	26	20	20	274
E. T. Rhodes: White Leghorn .. .	14	25	23	20	25	23	25	22	26	25	23	23	274
H. L. Abrook: White Leghorn ..	13	23	20	23	24	23	26	26	26	24	22	24	274
D. Sutton: White Leghorn . ..	2	5	27	24	25	27	30	28	25	30	24	25	272
Heavy Breeds.													
A. George. Black Orpington	16	28	28	28	27	30	26	26	23	24	25	26	307
O. E. Holmes: Black Orpington	16	25	25	25	26	29	26	24	26	24	23	28	297
A. R. Sinclair: Langshan . .	16	28	25	28	28	29	29	19	20	23	24	27	296
A. George: Black Orpington	14	20	25	26	27	29	29	29	25	21	23	27	295
T. McDonald: Black Orpington .	1	20	24	26	25	27	30	29	28	27	25	23	285
J. Waterhouse Rhode Island Red .. .	15	25	24	22	22	25	27	29	25	24	21	22	281
T. McDonald: Black Orpington .	0	28	26	25	25	28	29	26	25	25	24	24	280
W. Townsend: Langshan . . .	14	27	25	25	27	25	29	23	18	15	24	26	278
A. R. Sinclair: Langshan .. .	19	31	27	29	28	28	23	23	12	28	17	17	277
A. E. Brown. Langshan	13	25	28	26	30	27	25	21	16	22	19	24	276
K. J. H. Suhr: Langshan	13	28	27	27	20	27	29	25	5	26	24	25	276

Weights of Winning Birds.

The weights of the winning birds at the beginning and end of the competition should be of interest. They were:—

		Weight at April, 1923.		Weight at March, 1924.	
Individual Hens.		lb.	oz.	lb	oz.
Light Breeds—					
L. A. Ellis' White Leghorn, No. 294 ...		3	12	4	2
Heavy Breeds—					
A. George's Black Orpington, No. 8		5	8	5	8
Groups.					
Light Breeds— F. S. Longley's White Leghorns, Nos.	379	3	12	3	8
	380	3	12	4	0
	381	3	12	4	2
	382	4	0	4	10
	383	3	14	3	12
	384	3	10	4	8
Heavy Breeds— A. George's Black Orpingtons, Nos....	7	5	8	6	4
	8	5	8	5	8
	9	5	0	5	0
	10	5	4	6	0
	11	6	12	7	14
	12	5	6	5	12

AWARDS OF PRIZES AND CERTIFICATES.

GRAND CHAMPION PRIZE.

Grand Champion Prize, value £5 5s., for group of six birds laying eggs of greatest market value and of standard weight, without replacement of a bird—A. R. Sinclair, Langshans, 1,476 eggs, market value, £9 12s. 2d.

SPECIAL PRIZES.

Special prize of £10 10s., donated by Mr. A. E. Brown, Beecroft, for any group of Langshans winning the Grand Champion Prize (his own team excepted)—A. R. Sinclair, Langshans.

Special Prize of £5 5s., donated by C. Judson and Son, Thornleigh, for individual hen laying the greatest number of eggs of prescribed weight (their own team excepted) —L. A. Ellis, White Leghorn, 309 eggs.

SECTION PRIZES.

Greatest number of eggs laid in twelve months (individual hens)—

Heavy Breeds:—A. George (Black Orpington), 307 eggs, £3; G. E. Holmes (Black Orpington), 297 eggs, £2 10s.; A. R. Sinclair (Langshan), 296 eggs, £2; A. George (Black Orpington), 295 eggs, £1 10s.; T. McDonald (Black Orpington), 285 eggs, £1.

Light Breeds:—L. A. Ellis, 309 eggs, £3; F. S. Longley, 307 eggs, £2 10s.; Day Dawn Poultry Farm, 286 eggs, £2; Lewis and Stephens, 285 eggs, £1 10s.; F. S. Longley, 280 eggs, £1.

Greatest number of eggs laid in twelve months (group of six birds)—

Heavy Breeds:—A. George (Black Orpingtons), 1,600 eggs, £2 10s.; A. R. Sinclair (Langshans), 1,476 eggs, £2; T. McDonald (Black Orpingtons), 1,410 eggs, £1 10s.; W. Townsend (Langshans), 1,430 eggs, £1.

Light Breeds:—F. S. Longley, 1,508 eggs, £2 10s.; D. A. Ellis, 1,459 eggs, £2; Day Dawn Poultry Farm, 1,441 eggs, £1 10s.; C. C. Kennett, 1,429 eggs, £1.

Highest average (groups of five or six birds)—

Heavy Breeds:—A. George (Black Orpingtons), 267 eggs, £3; T. McDonald (Black Orpingtons), 260 eggs, £2 10s.; A. R. Sinclair (Langshans), 246 eggs, £2; Jobling and Son (Black Orpingtons), 240 eggs, £1 10s.

Light Breeds:—F. S. Longley, 251 eggs, £3; Day Dawn Poultry Farm, 247 eggs, £2 10s.; L. A. Ellis, 243 eggs, £2; C. C. Kennett, 238 eggs, £1 10s.

QUALITY PRIZES.

Open sections—for groups selected as conforming most closely to standard type, prizes being awarded for number of eggs laid:—

Light Breeds:—F. S. Longley, 1,508 eggs, £5; J. C. Smith, 1,421 eggs, £2 10s.

Heavy Breeds:—A. R. Sinclair (Langshans), 1,476 eggs, £5; A. E. Brown (Langshans), 1,389 eggs, £2 10s.

Standard sections—prizes allotted for greatest number of eggs:—

Light Breeds:—C. McKendry, 1,307 eggs, £2; A. H. Burwood, 1,104 eggs, £1.

Heavy Breeds:—W. Townsend (Langshans), 1,430 eggs, £2; Wenholm and Seddon (Langshans), 1,279 eggs, £1.

QUARTERLY PRIZES.

Winter test (10th April to 30th June, 1923)—

Light Breeds:—G. N. Mann, 309 eggs, £2; C. McKendry, 296 eggs, £1 10s.
Heavy Breeds:—Mrs. C. B. Ferguson (Black Orpingtons), 356 eggs, £2; C. Judson & Son (Black Orpingtons), 353 eggs, £1 10s.

Spring test (1st July to 30th September, 1923)—

Light Breeds:—F. S. Longley, 413 eggs, £1 10s.; F. C. Nicholls, 400 eggs, £1.
Heavy Breeds:—A. E. Brown (Langshans), 448 eggs, £1 10s.; A. George (Black Orpingtons) 447 eggs, £1.

Summer test (1st October to 31st December, 1923)

Light Breeds:—L. A. Ellis, 449 eggs, £1 10s.; E. Ferneyhough, 442 eggs, £1.

Heavy Breeds:—A. George (Black Orpingtons), 436 eggs, £1 10s.; J. Wheller (Black Orpingtons), 411 eggs, £1.

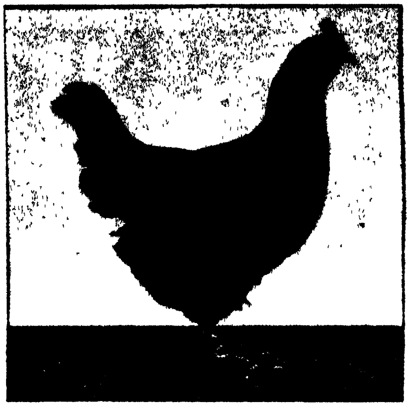
Autumn test (1st January to 31st March, 1924)—

Light Breeds:—F. S. Longley, 387 eggs, £2; L. A. Ellis, 377 eggs, £1 10s.

Heavy Breeds:—A. George (Black Orpingtons), 365 eggs, £2; A. R. Sinclair (Langshans), 334 eggs, £1 10s.

THE POULTRY EXPERT'S COMMENTS.

It is gratifying to find that although previous records have not been reached there is a return to higher production. The improvement embraces all sections with the exception of that for standard light breeds, in which the results are disappointing in comparison with the main body of the competition, but since it comprises only thirty birds out of 540, the general average has not suffered to a great extent. As will be seen from the main report, the general average over all sections is 205·2, while the highest tally in the groups is 1,600 and the highest hen 309—three having passed the 300 mark.



One of Mr. W. Townsend's pen of Langshan's.
Leading pen in the Standard Light Breeds Section.

Reference to the table will show that the best general averages of the whole series were made in the 15th, 16th, and 19th tests. It has been noted in previous tests that the first few weeks of the competition have invariably shown the quantity of production that might be expected during the currency of the test, and this last competition proved no exception to this rule. It started well with the first month and finished not far behind the record average of all sections—206 per hen—made in the 16th test.

Cause of Improvement.

In comparing the results obtained in this test with those of the last two years, it is necessary to state that there has been some divergence from the practices previously followed, the most important being the altering of the date of the commencement of the competition from 1st to 10th April. It was thought by the committee that the nine days lost in this way would be more than compensated for by the birds being put straight into the pens. Another deviation from the past practice was the elimination of lucerne meal from the morning mash.

Already one hears various expressions of opinion, that one or the other of these alterations has been responsible for the improved production. The contention has been made that an average nine days' laying should be added to the credit of the birds to make the results comparable with previous

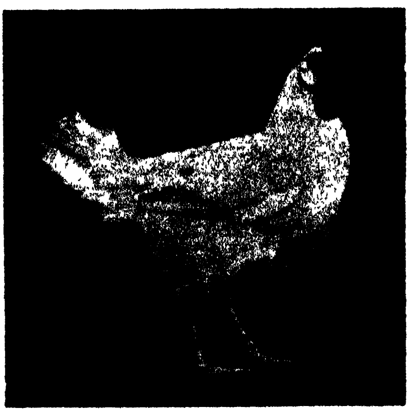
years. In this regard it must be said that the advantages of starting nine days late cannot be taken twice, and any allowance would cause the results not to be comparable with the remainder of the series. However, when drawing up the rules for this competition, provision was made to meet the case of any group or single hen that might have a chance of making a record, by keeping the birds at the college to complete the 365 days, but no records have been made in this test.

Mr. L. A. Ellis's White Leghorn.
Greatest number of eggs of prescribed weight in the competition (309 eggs).

It should be borne in mind that the increased production this year is only as compared with two previous years of very low production. The right thing to do is to compare the results of this year with the highest under the old conditions.

With regard to the absence of lucerne meal in the mash, it is worthy of note that in the last test (the 1922–23) only 8 cwt. 23½ lb. of lucerne meal was used, in comparison with 2 tons 625 lb. in the 1921–22 test. Whatever bearing lucerne might have had on the latter test, the small amount fed in the first mentioned could scarcely have had any appreciable effect. The tallies of the 1921–22 test were very low, and the 1922–23 test were still lower.

Taking these facts into consideration I prefer to wait for more evidence before subscribing to the belief that either of these alterations has resulted in the increased production.



One of Mr. C. McKendry's group of White Leghorns.
Leading pen in the Standard Light Breeds Section.

In my comments in last year's report the following appears:—"It behoves us all, both competitors and conductors of these tests, to look to our laurels. It is easy to blame the weather or some other circumstance, when the remedy may be within our own control. Breeding, selection, and feeding are each factors that concern us all." This advice still holds good, and the question might not be out of place whether its acceptance has had ever so small a bearing upon the return this year to more satisfactory performances. There is, in my opinion, room for still better results.

Egg-yields of Each Bird and Group in the Twenty-second Annual Competition.

Owner and Breed.	Totals of Individual Birds.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.
Open Light Breeds.								oz.	£ s. d.
F. S. Longley : White Leghorns ..	213	274	246	307	280	188*	1,508	25¼	9 19 10
L. A. Ellis : White Leghorns .	230	237	263	177	243	309	1,459	25	9 4 5
Day Dawn Poultry Farm : White Leghorns.	286	255	246	209	288	207†	1,441	24¾	9 4 3
C. C. Kennett : White Leghorns .	205	209	271	256	226	262	1,429	24¾	8 19 10
J. C. Smith : White Leghorns .	231	187	244	255	270	234	1,421	25¼	9 3 1
D. Sutton : White Leghorns	195	245	248	204	272	223	1,387	25¼	8 12 7
H. J. Cox : White Leghorns	199	241	262	230	217	235	1,384	24¼	8 14 1
G N Mann : White Leghorns .	191*	251	225	241	204	257	1,369	26	8 16 3
H. E Hounslow : White Leghorns .	248	250	238	181	222	218	1,357	25¼	8 11 11
M. McInnes : White Leghorns ..	216	176	253	247	228	234	1,354	25¼	8 11 8
F. G. Lombe : White Leghorns ..	268	213	243	195	230	191	1,340	25¼	8 6 9
B. Clarke : White Leghorns . .	239	213	215	264	192	212	1,335	25¼	8 5 10
Lewis and Stephens : White Leghorns.	285	217	187	201	196	247	1,333	24¾	8 5 7
L. A. Beckett . White Leghorns	233	216	206	221	255	201	1,332	25½	8 16 2
E. T Rhodes : White Leghorns	220	210	274	163*	270	190	1,327	24	8 9 7
H. P. Christie : White Leghorns .	238	157†	247	239	238	191	1,310	26¾	8 6 1
D. R. Dove : White Leghorns	198	247	200	185	219	239	1,288	24¾	8 1 6
P. R. Barsby : White Leghorns	208	260	211	148	218	237	1,282	26½	7 17 6
G. Dunlop . White Leghorns	216	215	244	179	284	142	1,280	25½	7 16 0
G. Hopping : White Leghorns	237	261	246	269	65	193	1,271	24¾	8 3 5
H. W. T. Hambly : White Leghorns,	196	175	251	217	181	250	1,270	25¾	7 14 9
J M. Brooke : White Leghorns	200	218	158	244	240	209	1,269	26¼	7 18 1
F. T. Wimble : White Leghorns	169	224	231	247	219	179	1,269	24½	7 18 4
E. H. Shipp : White Leghorns	194	212	180	249	242	190	1,267	24¾	7 17 4
F. S Horner : White Leghorns .	232	243	218	158	207	208	1,266	25½	7 17 5
F. C. Nicholls : White Leghorns	215	215	194	216	199	222	1,261	25¾	7 15 6
T. E. Jarman : White Leghorns	251	229	208	187	161	222	1,258	26¾	8 6 2
Hilder Bros. : White Leghorns	128	244	232	234	160	259	1,257	24¼	7 19 7
E. Ferneyhough White Leghorns .	199	206	185	230	212	222	1,254	25¼	7 7 2
D. Beveridge : White Leghorns	121	249	232	210*	186	237	1,235	26	7 13 2
H. Hathway ; White Leghorns .	239	172	166	197	230	229	1,233	25¾	7 8 11
J. O. Roberts : White Leghorns	197	213	215	262	129	215	1,231	25	7 10 0
Anderson Bros. White Leghorns .	246	144	264	227	165	175‡	1,221	24¼	7 12 3
H. L. Abrook : White Leghorns	179	244	206	274	49†	252	1,204	24¼	7 13 0
A. Chick : White Leghorns ..	251	154	253	199	166	176	1,199	25¼	7 7 10
Watson and Stepney : White Leghorns.	277	218	172	220	63	244	1,194	24¾	7 13 8
J. Rayner : White Leghorns .	243	202	242	217	105	176	1,185	26	7 4 9
M O. Byrne : White Leghorns .	222	41	246	142†	275	247	1,173	24¼	7 19 4
A. Falconer : White Leghorns ..	116	241	188	185	181	261	1,172	25¼	7 9 5
R. McLean : White Leghorns .	232	202	135	187	170	246	1,172	26	7 15 2
A. Greentree : White Leghorns .	205	159	199	190	193	224	1,170	25	7 1 4
J. R. Sellors : White Leghorns .	185*	205	248	192	157‡	181	1,168	26	7 6 10
W. Mulcahy : White Leghorns	232	213	240	192	169	119	1,165	24¾	7 4 11
C. House : White Leghorns .	197	210	91	208	214	225	1,145	25¼	6 19 11
E Smith : White Leghorns . .	228	216	141	141	194	222	1,142	25¼	7 2 1
A. Crowe : White Leghorns . .	159	234	179	162†	208	195	1,137	26¼	6 15 0
D. Asher : White Leghorns ..	37†	261	255	118	222	180	1,073	26	6 12 8
H. M. Walker : White Leghorns .	199	175	153	168	206	159	1,060	28	6 4 9
J. C. Hepher : White Leghorns	112	239	113†	187	254	134	1,039	24¾	6 4 3
R. G. Christie and Son : White Leghorns	198	183†	96	75†	222	168†	942	25	6 1 3
Standard Light Breeds.									
C. McKendry : White Leghorns	244	241	217	182	196	227	1,307	26	8 8 5
A. H. Burwood : Brown Leghorns ..	172	159	212	199	127	235	1,104	24¾	6 15 10
A. Meservy : White Leghorns .	195	229	113	133†	191	216	1,077	27	6 11 4
C. A. Clarke : Minorcas	184	103	103	150	204	183‡	927	25¼	5 10 1
W. J. Hill : White Leghorns . .	56†‡	93	125	243	12†	163	692	24¾	4 6 3

* Signifies bird replaced and score struck out. † Signifies bird dead and score retained.

‡ Signifies bird did not lay eggs of prescribed weight.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-SECOND ANNUAL COMPETITION—*continued.*

Owner and Breed.	Totals of Individual Birds.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.
			Open Heavy Breeds.						
								oz.	£ s. d.
A. George: Black Orpingtons	204‡	397	269	295	267	258	1,600	24¼	10 2 9
A. R. Sinclair: Langshans	229	214	219	241	296	277	1,476	25	9 12 2
T. McDonald: Black Orpingtons	280	112†	224	246	285	263	1,410	25½	9 2 6
A. E. Brown: Langshans	157	249	276	257	219	231	1,389	25	8 14 11
G. E. Holmes: Black Orpingtons	207	227	178	189	208	260	1,368	25¾	8 17 8
Mrs. C. B. Ferguson: Black Orpingtons	218	195	218	249	262	221	1,363	25½	8 18 8
J. Every: Langshans	214	237	201	212	242	256	1,362	25¼	8 17 6
A. R. Kennedy: Black Orpingtons	228	227	258	244	225	172	1,354	25	8 13 7
Judson and Son: Black Orpingtons	243	217	196	249	198	249	1,352	25½	8 15 3
Grasemere Poultry Farm: Black Orpingtons.	203	229	216†	214	228	234	1,324	25¼	8 6 7
K. J. H. Suhr: Langshans	172	208	261	246	276	95†	1,258	25¼	8 3 10
J. D. Martin: Plymouth Rocks	223	178	253	205	170	227‡	1,256	23¾	8 7 11
R. Mallard: Black Orpingtons	233	179	266	177	178	215	1,248	25	7 17 11
C. Watts: Black Orpingtons	219	165†	200	230	219	184	1,217	25¾	7 14 10
Hillside Poultry Farm: Silver Wyandottes.	191	204*	190	182	194	253	1,214	25¾	8 0 7
Jobling & Son: Black Orpingtons	15*†	281	248	225	227	218	1,214	26¼	7 19 2
J. Wheller: Black Orpingtons	131	200	195	272	198	211	1,207	27¼	7 13 10
A. E. Ross: Langshans	232	200	244	195	124	201	1,196	25¼	7 15 1
E. C. Lunn: Black Orpingtons	202	150	192	216	205	229	1,194	24¼	7 5 4
J. H. Madrers: Black Orpingtons	231	219	262‡	24	219	231	1,186	24	7 16 3
A. E. Jerrett: Black Orpingtons	219	133	206	116	194	270	1,138	25½	7 8 1
H. R. Woolf: Langshans	218	125	216	240	77	258	1,134	26	7 6 6
J. Waterhouse: Rhode Island Reds	196	237‡	281	24†	225	151†	1,114	24	7 9 1
A. Moxey: Black Orpingtons	163†	238	243	215	162	53	1,074	24½	7 0 3
A. C. Smith: Langshans	150†	145	235	130	254	156	1,070	26	6 16 10
J. Gilbert: Langshans	165	167	97	223	220	185	1,057	25¼	6 17 9
P. A. Barrett: Langshans	158	135	196	189	217	150	1,045	25¼	6 5 10
W. H. Whittorn: Black Orpingtons	143	135	264	141	107†	167	957	24¼	6 10 1
E. B. Wilshire: Black Orpingtons	216	108	148	67‡	173	193	905	26¼	6 1 8
W. J. Gilbert: Black Orpingtons	135	173	132	179	107	145	871	26¼	5 6 11
			Standard Heavy Breeds.						
W. Townsend: Langshans	278	249	245	194	227	237	1,430	25¼	9 7 9
Wenholm and Seddon: Langshans	169	241	216	247	171	235	1,279	26	8 4 4
F. M. Weierter: Silver Wyandottes	217	198	229	251	99†	243	1,237	24¼	8 3 4
W. L. Mulliner: Black Orpingtons	271	112†	159	188	224	212	1,166	25	7 16 5
Mrs. C. Dobbie: Plymouth Rocks	165	215	170	149†	144	200	1,052	25¼	6 11 8

* Signifies bird replaced and score struck out. † Signifies bird dead and score retained.

‡ Signifies bird did not lay eggs of prescribed weight.

CROSS-POLLENATION EXPERIMENTS WITH PRUNES.

EXPERIMENTS in the cross-pollenation of Robe de Sergeant prunes were continued at Yanco Experiment Farm last season, trees of similar size and shape being pollenised with blossoms of Prune d'Agen, Sugar Prune, Angelina Burdett, and President Plum. The weights of fresh fruit obtained from the trees so treated were 27·5 lb., 39·5 lb., 52·5 lb., and 45 lb. respectively—an average of 41·1 lb. per tree, as compared with an average of 39 lb. from four unpollenised check trees. The difference between the yields from the two lots of trees was not so great this season as last, but the experiment was to a certain extent interfered with by wet and windy weather.—W. W. COOKE, Orchardist, Yanco Experiment Farm.

Poultry Notes.

MAY.

JAMES HADLINGTON, Poultry Expert.*

The Development of the Poultry Industry.

To get some idea of the development that has taken place in the poultry industry in recent years, its present position, and its prospects, it is necessary first to look back some twenty years or more.

Prior to the advent of egg-laying competitions, poultry-farming in this State—and indeed in the Commonwealth—had scarcely attained the dignity of an industry. Of poultry keepers there were many—of poultry farms in a commercial sense there were but few. Our egg supply was drawn principally from the general farmer, the orchardist, and the quite numerous suburbanites who kept poultry as a hobby. Eggs coming from the last two sources were doubtless as good as our present day supplies, but those from the country farmer were no more satisfactory than they are to-day. The great drawbacks with regard to eggs from this source were, and still are, the want of facilities for quick marketing, together with the lack of system in gathering, packing, and grading, which are incidental to side-line production. All this, of course, meant deterioration. In consequence, Sydney market (the best in the Commonwealth) was not well supplied with fresh eggs. In winter time, eggs were 2s. 6d. to 3s. per dozen : in spring and early summer they were 7d. to 9d.. and a really fresh egg was a luxury only enjoyed by those who kept poultry.

The value of poultry products for 1903-4 is set down at £821,000, while that for 1922-23 is set down at £2,750,000. The figures for the past twenty years are given in the following table :—

Year.	Production. £	Year.	Production. £
1903-4	821,000	1913-14	1,578,000
1904-5	619,000	1914-15	1,597,000
1905-6	899,000	1915-16	2,144,000
1906-7	1,008,000	1916-17	1,908,000
1907-8	1,035,000	1917-18	2,082,000
1908-9	1,202,000	1918-19	2,501,000
1909-10	1,309,000	1919-20	2,814,000
1910-11	1,170,000	1920-21	3,196,000
1911-12	1,280,000	1921-22	2,650,000
1912-13	1,401,000	1922-23	2,750,000

In those early years the conditions under which poultry were run almost precluded the possibility of the cost of production being determined.

The Advent of the Competitions.

Whatever might be charged against egg-laying competitions, there is no question that they have been a great stimulus to specialised poultry-farming.

* Notes of a lecture delivered at the Royal Agricultural Society's Show, Easter, 1924.

To this factor we owe, in a great measure, the existence to-day of an industry worth nearly £3,000,000 per annum, which is sustaining at least 2,000 poultry-farmers and their families who have no other source of income. In addition, there are those who run poultry as a side-line, many of whom make a certain amount of income from the industry.

There are those who will opine that poultry is essentially a side-line proposition. This was the old idea, but what, it might be asked, was the progress made during that regime? Our figures will speak for themselves as regards volume, but there is another side to the question—was this side-line business really profitable? I am afraid that in most cases the glamour of income from hens was not properly balanced against the food consumed off the farm, and that in very many cases the income obtained from poultry was really obtained at a loss. At the present time no one need remain in ignorance of the cost of production as far as feeding is concerned.

Specialised poultry-farming, like the factory system in other industries, has come to stay, and poultry-farming under the new conditions must pay or the industry must die.

What of the Future?

To the question, what are the prospects of the industry, the answer might be given in two words—"never better"—but in view of the fact that at present values and cost of production the supply has just about overtaken local demand, this assertion requires some support. The fact is that we have reached a stage in the development of the poultry industry similar to that arrived at by almost every primary industry upon which the nation depends for its prosperity, viz., export.

The Prospects of Export.

We are even now but on the threshold, as it were, of a systematised profitable export of eggs. Here we are faced with the fact that up to very recent years the export of eggs has been negligible. The following table shows the export of eggs in the ten years ending June, 1923:—

Year.	Dozens.	Value. £
1913–14	3,520	279
1914–15	11,579	701
1915–16	2,834	203
1916–17	7,567	463
1917–18	15,712	1,438
1918–19	7,295	664
1919–20	208,809	17,257
1920–21	370,994	49,344
1921–22	396,724	42,934
1922–23	1,049,177	86,122

The facts show that the only reason why this State has not been profitably exporting eggs in larger numbers is because we have not had a sufficient surplus of eggs to force us into the position where we had to seek markets overseas. If proof of this were needed it would be found in the fact that the last export season has proved profitable—and this while our return per hen

over cost of feeding has been below the mean for several years. It may be granted that no matter when organised export of eggs was essayed, we were liable to go through experiences similar to those of any other industry that has survived the same crisis. Losses have been made, and a name had to be made for our eggs before payable prices could be realised. That this stage has been reached will be seen from the prices made for our eggs compared with those made by our strongest competitor on the London market, viz., Denmark.

The quotations on the London market for November, 1923, were as follows:—

Danish eggs	22s. to 24s.	per long hundred or 10 dozen.
Australian eggs	20s. to 21s.	,, ,, ,,
African eggs	17s. to 21s.	,, ,, ,,

The gross realisation for our eggs in London market for the whole of last export season was 2s. 1¾d., which would show a net return in Sydney of 1s. 4½d. per dozen.

The latest figures regarding the quantity of eggs imported into Great Britain show that the total value cannot be less than £9,000,000. With such an extensive market, to which we have already had the definite experience of exporting (and the returns from the eggs sent have shown profits), who will set a limit to the expansion of the poultry industry? The opinion may be advanced, based upon a fair knowledge of the quality of the eggs exported from this State, that as we have come so near to the prices realised for Danish eggs with the quality sent, we can go very much nearer to them with the quality we should be able to send in the future.

If proof of this were necessary it would be found in some recent reports to the effect that the eminent English poultry expert, Mr. Brown, had examined a special shipment of New Zealand eggs and found them of excellent quality. After most exhaustive tests in cooking, they compared favourably with the "Home" product—and this after seven weeks in cold storage on the boat!

Meanwhile, owing to a good deal of controversy in respect of cold-stored eggs, I had been conducting a series of experiments with the object of determining the same question. The results have already been published. The point is that the question of quality is in our own hands, and I am satisfied that we can just as easily compete in the markets of Great Britain with eggs as we do with butter. The fact is that we are only just waking up to the possibilities that lie before us in this direction, and it is safe to say that the history of the dairy industry will be very largely—if perhaps on a lesser scale—repeated with poultry products.

Organisation.

What organisation has done for the dairy industry it can do for ours. In this connection, it is barely eight years since the first move was made towards organisation in a commercial way. To-day we have several

flourishing district co-operative associations which are purchasing supplies wholesale, and distributing to their members. The combined operations of these societies probably exceed £100,000 per annum. That of Miranda district alone amounts to over £30,000, but there is ample room for extension.

If we turn to the marketing end, we find great strides are being made, and, although efforts in this direction are not well co-ordinated, there is hope for the immediate future. Exports have been made on behalf of pools, and, although up to last season results were not entirely satisfactory, the ground has been broken, and, as already indicated, success is practically assured, not alone from the fact of better prices obtained, but from the circumstance that packing, grading, and general expenses have been reduced by about 25 per cent., and a much superior article landed at destination. The latter fact is recognised by the higher prices made for our eggs. This is what organisation by poultry men for poultry men is doing; and, whatever the views of the new men in the business, the more experienced must surely recognise that the portents are for greater stability and prosperity in the industry.

A Neglected Field of Agricultural Research.

THE contributions of scientific research to agricultural development in the past have been enormous. In fact, the entire structure of modern agriculture is founded on scientific discoveries. It will, however, only require a hasty and superficial survey of the situation to indicate that the opportunities for still further contribution are even greater at this time than they have ever been in the past. Certain fields of agricultural research have been almost entirely neglected up to the present time. Probably the most outstanding one is the weed problem. Weeds undoubtedly do as much or more to reduce the annual crop production as do insect pests or plant diseases, and yet they are just beginning to receive attention.—E. D. BALL, Director of Scientific Work, U.S. Department of Agriculture.

Agriculture Must Lower Costs.

MR. CARNEGIE said one day, "I will give a million dollars to the man who will teach me how to lower the cost of steel 10 cents a ton." When Carnegie, with all his experience, was willing to pay this sum to lower his production costs 10 cents a ton, is it not worth while for us to see whether we can lower the costs of production of our basic industry? In the production of milk our figures show a range in costs varying over 400 per cent. What would happen to the steel industry if it were run on such a wide variation in costs?—H. L. RUSSELL, Dean of the University of Wisconsin College of Agriculture, in the *Banker-Farmer.*

The British Standard Apple Case.

(18 x $10\frac{1}{2}$ x $11\frac{1}{2}$).

H. BROADFOOT, Assistant Fruit Expert.

REPORTS having appeared in various Canadian and New South Wales agricultural papers that Canada had adopted the 18 x $10\frac{1}{2}$ x $11\frac{1}{2}$-inch case in place of the old case, 20 x 10 x 11 inches, this Department of Agriculture asked the Departments of Agriculture in British Columbia, Canada, and the United States for reports, and received the following replies :—

1. From the Coast and Market Commissioners, Vancouver, British Columbia.—"Our original standard export box was 10 x 11 x 21 inches, inside measurements. After some years of use this box has been almost entirely replaced by our 18 x $11\frac{1}{2}$ x $10\frac{1}{2}$. Under a new Act framed by the Federal Government the latter is now the legal box for local, inter-provincial, and export trade."

2. From the Canadian Department of Agriculture :—"The inside dimensions of the Canadian apple box are now $10\frac{1}{2}$ x $11\frac{1}{2}$ x 18 inches."

3. From the Department of Agriculture, United States of America :—"Several states have already adopted an apple box $10\frac{1}{2}$ x $11\frac{1}{2}$ x 18 inches, inside measurements, as the standard. Washington, Idaho, Montana, and Oregon have taken this step, and the State of California has already made this box the standard, but has permitted the use of a box of somewhat different dimensions, which is known as 'the California box.' This box when used must be marked 'non-standard.' Although there is no Federal legislation governing the dimensions of apple boxes, the box first referred to ($10\frac{1}{2}$ x $11\frac{1}{2}$ x 18) is now used almost universally in U.S.A."

On the strength of these reports it was decided to test the British standard apple case. In the trial one-quarter inch was added to the $11\frac{1}{2}$-inch dimension to bring it up to the Imperial bushel size. The first trials were made with a case $10\frac{1}{2}$ inches wide and $11\frac{3}{4}$ inches deep, but quite early in the tests this proved ill-adapted to a standard space pack. A trial was then made with a case $11\frac{3}{4}$ inches wide and $10\frac{1}{2}$ inches deep. This case, with a 3–2 pack, took four tiers, and with London Pippins took the following counts, all packed on edge or cheek :—

3–2 x	5–4	90
,,	5–5	100
,,	6–5	110
,,	6–6	120
,,	7–6	130
,,	7–7	140

The 7–7 was the highest row count that would come high enough with 3–2 in four tiers, and at first the arrangement proved difficult, the change to the

3–3 × 6–6 row count × 5 tiers coming too high. To bridge this difficulty a flat 3–3 pack with a row count of 4–4, taking six tiers = 144 was used, taking apples about 2⅝ inches in diameter, and then running on to 7–6 of the 3–3 on edge in five tiers, and continuing on edge in this pack to the 7–7 in five tiers. Not only was the break in the sequence objectionable, but resort was made to a flat pack, which was to be avoided.

Since the first tests were carried out, the case 18 in. x 10½ x 11½ has been included in those allowed by the Commonwealth Export Act. Further tests were made at the orchard at Glen Innes Experiment Farm with Granny Smith apples. Apples were chosen to give a high and a low count, and also an intermediate count to bridge between the two packs 3–2 and 3–3. It was desired to pack eight British Imperial standard boxes and eight Canadian cases with similar sizes, in order to compare the packs in each type of case, and to see how they opened up after a long journey.

The apples chosen (Granny Smith) were passed through leather rings of various diameters in order to get accurate and uniform sizing, so that the apples in each type of case would be uniformly sized. The apples were wrapped and packed, and the lids were fastened down in a nailing-down press. The appended chart established a comparison between the contents in the two types of box.

The apples were then consigned to the Export Branch of the Department, Sydney, by goods train, the journey being over 400 miles. On arrival they were opened up in the presence of officers of the Fruit Branch and of agents from the fruit markets, and the unanimous opinion was that no difference could be observed in the condition of the apples contained in the two types of boxes. The apples opened up well, the case being full, and the contents free from bruises.

It will be observed that, in the first test, using a flat apple with a wide cavity (London Pippin), it was necessary to change on to one count flat packing when changing from 3–2 to 3–3 pack. When packing a different shaped apple (Granny Smith) the change takes two flat packs. The case, too, as now adopted (18 x 10½ x 11½) will cause a change (3–2 to 3–3) at a lower count than is shown in the first chart.

The case in question also takes more flat packs than the Canadian. In nailing down, the longer case (Canadian, 20 inches) is preferable to the shorter (British standard, 18 inches).

It will also be observed that both the new case, now called the British standard apple box, and the old Canadian case have wider ends than the Australian bushel case. This is a distinct disadvantage when cases are made from Australian timbers, because (as was pointed out by Tasmania) of the big allowance which must be made for shrinkage in a wide head or end.

An alternative is worthy of trial, viz., that the ends be made of two pieces, cleated with two light cleats. Half the shrinkage is then taken up between the joint of the two boards. To avoid the cleats making the overall

length of the case greater, the ends need be only ½ inch thick, and the cleats ¼ inch thick, thus giving ¾ inch ends, which is about the average thickness of uncleated ends. Wide ends are far more liable to split than narrower ends, and some provision is necessary to prevent this. The Americans prevent it by making the grain run longitudinally between top and bottom of the case, putting a very light cleat at each end when making the box, and a cleat at each end of top when nailing the lid down. This cleat would not, as a rule, extend beyond the spring or bulge at top or bottom when the case is packed and nailed down, but it has this drawback, that a case will frequently split while being packed or during nailing down.

Cleats as suggested for a two-piece end would prevent any chance of this. If the ends were cut so that the grain ran from side to side, then, in case of abnormal shrinkage, they could easily be made up in depth by a cleat along the top of each end. This making up could not be done if the grain ran the other way, except by removing a side of the box.

If it were proposed that the case 18 x 10½ x 11½ be universally adopted by the apple-producing countries of the world, there appears to be no valid reason why Australia should not fall into line. If we did otherwise, we would be handicapped by supplying a larger package than our competitors.

The following table compares the British standard apple box (Oregon case) with the Canadian bushel case when packed with Granny Smith apples :—

British Standard Apple Box.	Net weight. lb.	*Canadian Bushel Case.*	Net weight. lb.
3-2 x 4 tiers x 4-4 edge, 80, 3⅜" ...	43	3-2 x 4 tiers x 4-4 edge, 80, 3⅜" .	43
3-2 x 4 ,, x 5-4 edge, 90, 3¼" ...	43½	3-2 x 4 ,, x 5-4 edge, 90, 3¼" ...	45
*3-2 x 5 ,, x 5-4 flat, 113, 3" ...	44½	3-2 x 4 ,, x 6-5 edge, 110, 3" ..	44
3-2 x 5 ,, x 5-5 flat, 125, 2⅞" ...	—	3-2 x 4 ,, x 6-6 edge, 120, 2⅞" ..	—
3-3 x 5 ,, x 5-5 edge 150, 2¾" ...	46½	3-2 x 5 ,, x 6-5 flat, 140, 2¾" ...	43
3-3 x 5 ,, x 6-5 edge, 165, 2⅝" .	46½	3-3 x 5 ,, x 6-5 edge, 165, 2⅝"...	46¼
3-3 x 6 ,, x 6-5 flat, 198, 2½" ..	48	3-3 x 5 ,, x 7-6 edge, 195, 2½"...	46
3-3 x 6 ,, x 6-6 flat, 216, 2⅜" ...	45	3-3 x 6 ,, x 7-6 flat, 234, 2⅜" ...	48½

* Packs rather high at the ends, 3-3 x 5-4 on edge.

The 100 count packs too low, 3-2 x 5-5 in 4 tiers on edge, and too high, 3-2 x 4-4 in 5 tiers. The larger fruit of this count must consequently be absorbed by the 90 count, and the smaller by the 113 count.

An Inquiry for Popcorn.

A COMMUNICATION has been received by the Department from a Sydney firm asking that they be put in touch with any growers of popcorn who are in a position to supply this commodity. The firm referred to desires to purchase some two or three tons. The Under Secretary and Director of Agriculture, Department of Agriculture, Sydney, would be pleased to put farmers interested in touch with the firm.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat:—

Canberra	Manager, Wagga Experiment Farm, Bomen.
	J. Haggart, Warre Warral.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	J. W. Eade, Eade Vale, Euchareena.
	J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
	Mailer Bros., Trundle Park, Trundle.
	H. M. Hall and Sons, Studbrook, Cunningar.
	H. K. Nock, Nelungaloo.
	Hobson Bros., Glenlea, Cunningar.
	R. J. O. Berryman, The Wilgas, Trundle.
	A. Mill, Durran, Gunningbland.
	Mrs. J. D. Berney, Kildara, Cumnock.
	Hughes Bros., Pullabooka.
Clarendon	J. W. Eade, Eade Vale, Euchareena.
	Mrs. J. D. Berney, Kildara, Cumnock.
Cleveland	J. W. Eade, Eade Vale, Euchareena.
	W. Burns, Goongirwarrie, Carcoar.
College Purple	Hobson Bros., Glenlea, Cunningar.
Currawa...	J W. Eade, Eade Vale, Euchareena.
	H. K. Nock, Nelungaloo.
Federation	Mailer Bros., Trundle Park, Trundle.
	H. M. Hall and Sons, Studbrook, Cunningar.
Florence...	T. R. Jones, Birdwood, Marsden Road, Forbes.
Gresley	E. J. Allen, Gregra.
	J. W. Eade, Eade Vale, Euchareena.
	T. J. A. Fitzpatrick, Erin Vale, Warre Warral.
	Mailer Bros., Trundle Park, Trundle.
	Mrs. J. D. Berney, Kildara, Cumnock.
	Hughes Bros., Pullabooka.
Hamel	Mailer Bros., Trundle Park, Trundle.
	Hobson Bros., Glenlea, Cunningar.
Hard Federation	E. J. Allen, Gregra.
	Mrs. J. D. Berney, Kildara, Cumnock.
	J Parslow, Kelvin Grove, Collie Road, Gilgandra.
	Mailer Bros., Trundle Park, Trundle.
	H. K. Nock, Nelungaloo.
	Hughes Bros., Pullabooka.
Marshall's No. 3	Hobson Bros., Glenlea, Cunningar.
	E. J. Allen, Gregra.
	Mrs. J. D. Berney, Kildara, Cumnock.
	Hughes Bros., Pullabooka.
Marshall's No. 3 (*ungraded*) ...	C. Hayes-Williams, Farm 1,456, Yenda.
Onas	H. K. Nock, Nelungaloo.
Penny	Hobson Bros., Glenlea, Cunningar.
Rymer	Mrs. J. D. Berney, Kildara, Cumnock.

Wheat—continued.	
Waratah...	J. Haggart, Warre Warral.
	H. M. Hall and Sons, Studbrook, Cunningar.
	Hobson Bros., Glenlea, Cunningar.
Yandilla King	Manager, Experiment Farm, Temora.
	Mailer Bros., Trundle Park, Trundle.
	Hobson Bros., Glenlea, Cunningar.
Barley:—	
Cape	Manager, Experiment Farm, Bathurst.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The Veterinary Surgeons Act, 1923.

Under the provisions of the Veterinary Surgeons Act it is incumbent on all persons desiring to practise as veterinary surgeons to obtain a certificate of registration from the Board of Veterinary Surgeons of New South Wales. It is further provided that after a period of six months from the coming into operation of the Act, no person other than a registered veterinary surgeon shall practise as a veterinary surgeon or take or use the name veterinary surgeon or the term veterinary or any abbreviation thereof either alone or in connection with any other name, title or business, except as indicating that he carries on a business as a supplier of wares or materials used in connection with veterinary science.

As the period of six months referred to above will terminate on 30th June, 1924, any person wishing to practise as a veterinary surgeon should take immediate steps to obtain registration. The necessary forms and information can be obtained from the office of the Registrar of the Board of Veterinary Surgeons at 56 Bridge-street, Sydney.

A copy of the Act and regulations showing the conditions which must be complied with to obtain registration, and also the necessary documents which must accompany the application, can be seen at the office of any Inspector of Stock, and at any Court of Petty Sessions. With regard to the documents required, it may be pointed out that Form A, as prescribed by the Act, is one of the most essential. It will be noted that on the form is a space for the thumb-prints of the applicant. It has been decided to include this in order to protect the holders of certificates of registration from impersonation. The Inspector-General of Police has very kindly arranged that any applicant may use the thumb-print apparatus which is kept at all centres where Courts of Petty Sessions are held, to take his own thumb-prints on the form himself. The necessary apparatus will also be available at the office of the Registrar of the Board of Veterinary Surgeons at 56 Bridge-street, Sydney. This system is being introduced by universities, medical boards, &c., in connection with their certificates and diplomas, and should be of considerable value in preventing fraud and impersonation.

An approved photograph is required, a copy of certificate of registration of birth or a statutory declaration as to age at the time of application, statutory declarations as to good name and character, and a further statutory declaration of the possession of the qualifications necessary for registration. Certificates of degrees, diplomas, and licenses must also be submitted when held, and in other cases statutory declarations from four responsible persons in support of the claim for registration. Applicants would be well advised to read the sections of the Act under which they propose to claim registration. It should be noted that in certain cases an examination is provided for.

Orchard Notes.

May.

W. J. ALLEN and W. LE GAY BRERETON.

The packing season for apples and pears is now practically completed, and the sheds should be prepared for closing down. All cases or other receptacles that have held fruit infected with codlin moth should be dipped in boiling water. The larvae of this insect will push their way under joints apparently quite close, and to make sure that the boiling water reaches them the cases should be submerged for at least three minutes. All benches and other packing appointments should be thoroughly searched for codlin moth and scalded with boiling water. Where canvas or bagging is used for packing bins it should be taken off and dipped in boiling water.

There are fungus diseases which attack fruits after picking, and to check the accumulation of these, a disinfectant should be added to the water. Only a short time ago a Victorian grower was troubled by his peaches arriving on the market in a bad condition, and on investigation it was found his packing-shed was infected with a disease that attacked the fruit during transit. After the shed had been thoroughly disinfected no more trouble was experienced.

Insect Pests.

During the busy time of picking, woolly aphis often makes headway, and trees so affected should be sprayed as soon as the leaves have dropped sufficiently.

When spraying for this pest it is necessary to use a high pressure and to hold the nozzle close to the affected parts, so as to break up the clusters. Spraying in this manner uses up a lot of spray which lies about the butt of the tree, and for this reason it is far better to use tobacco wash than miscible oil when the trees are badly infested.

Where bandages for codlin moth are in use it is advisable to leave them on well into the winter, as it is quite common as the winter advances for grubs to leave less secure hiding places and to shelter in the bandages.

Citrus trees which are affected with scale, and which have not been dealt with earlier, can still be fumigated. Late fumigation will generally give a satisfactory kill, and thus relieve the trees, but much of the dead red scale will adhere to the fruit.

Odd Jobs.

The deciduous fruit grower looks for a breathing space between the packing and pruning season, and though this time is only short when late apples are grown, an effort should be made to get those odd jobs done that are necessarily put off during the packing season.

It is a good plan to keep a sheet of paper or white cardboard tacked up in some handy position, so that any job which has been put off during a busy time can be noted, and not forgotten when a slack time comes.

If the ground is not too wet for carting, it is a good time to cart out any available farmyard manure to weak trees.

Pruning.

Generally speaking, it is unwise to prune deciduous trees early, for fear that a spell of warm weather may follow and cause buds to burst. Tests carried out by the Department have failed to give consistent results, and we therefore cannot say definitely whether a tree pruned is more likely to start into growth during a warm spell in early winter than one that has not been pruned. However, if the weather is fine during May, it is generally more economical in large areas to make a start on those stone-fruit trees (cherry-trees excepted) which have shed their leaves.

The Question of Wet or Dry Milking.

In the *Journal* of the Ministry of Agriculture (London), J. Mackintosh, N.D.A., National Institute for Research in Darying, Reading, discusses the question of wet or dry milking. Much of the criticism of dry-hand milking comes, he says, from those who have never tried that method in conjunction with systematic washing of the udder and teats. Where such a method is practised, it will be found that both milkers' hands and cows' teats become more flexible, and wet milking with milk as the lubricant becomes unnecessary and is soon recognised as a dirty habit. When a cow has sore teats, it is permissible to use vaseline during milking, but in such cases great care must be taken that the milk never touches the hands. In severe cases the milk thus obtained should not be mixed with that offered for sale.

From personal experience he has found that the adoption of dry milking, combined with careful cleaning, has resulted in the skin of the teats becoming of a soft yet tough texture, with a greater freedom from sores, and the whole operation of milking has become much more easy and pleasant.

The Inheritance of Milk Production.

"In their chronological order, choice by type, choice by pedigree, and choice by performance have been practised in selecting cattle." So said John W. Gowen, Biologist, in an address at the World's Dairy Congress, in which he reviewed briefly the relative value of these methods of determining the merits of cows.

As a result of extensive studies of the performances of certain breeds, he was able to show that performance records offer a much better means of choosing dairy cattle than either of the other methods. The milk yield of the dam predicts the probable milk yield of her daughters quite accurately. Thus, the average milk yield of daughters coming from dams of 12,000 lb. milk yield was 16,016 lb., and those coming from dams of 26,000 lb. milk yield was 23,279 lb. The milk yield of the daughters increases as the milk yield of the dam increases. A similar relation exists for the butter percentage. A cow also indicates the milk yield of her full sister quite accurately; in fact, a full sister's record is as good for predicting the milk yield of a cow as the record of the dam of that cow.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Ulmarra P. and A. Society	S. Spring...	May 14, 15
Coonamble P. and A. Association	J. C. Wilson	„ 14, 15
Lower Clarence A. Society (Maclean)	E. D. Munro	„ 21, 22, 23
Narromine A. H. and P. Society	C. E. Skinner	„ 22, 23
Warren P. and A. Association	A. C. Tompson	June 4, 5
Illabo P. A. and I Society	J. M. Hamilton	Aug. 20
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	„ 26, 27, 28
Grenfell P. A. & H. Association	Geo. Cousins	Sept. 2, 3
Cootamundra A. P. H. & I. Association	W. W. Brunton	„ 9, 10
Culcairn P. A. H. and I. Society	A. J. Ralph	„ 9, 10
Ganmain A. & P. Association	A. R. Lhuede	„ 16, 17
Temora P. A. H. & I. Association	A. D. Ness	„ 16, 17, 18
Junee P. A. and I. Society	T. C. Humphrys	„ 23, 24
Corowa P. A. and H. Society	J. D. Fraser	Oct. 3, 4
Berrigan A. and H. Society	R. Wardrop	„ 7
Narandera P. & A. Association	W. H. Canton	„ 7, 8
Deniliquin P. and A. Society	P. Fagan ...	„ 15
Griffith A. Society	M. E. Sellin	„ 15, 16
Lismore A. and I. Society	H. Pritchard	Nov. 18, 19, 20

1925.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 16, 17
Wollongong A. H. and I. Association	W. J. Cochrane	„ 29, 30, 31
Guyra P. and A. Association	P. N. Stevenson	Feb. 17, 18, 19
Newcastle A. H. and I. Association	E. J. Dann	„ 24 to 28

Standardisation of Farm Products.

The benefits from well-defined and generally accepted standards for farm products are no longer seriously questioned. With premiums being paid for products of uniform grade, coupled with high costs of transporting and handling non-standardised products, farmers have come to realise the value of this work. Standardisation of fruits and vegetables received fresh impetus from the inauguration of the shipping point inspection, as uniform standards are fundamentally necessary to the successful operation of an inspection service. At the present time Federal standards are being used for a large number of the most important fruits and vegetables, and many of these standards have been made mandatory under State laws.—*Annual Report of the United States Secretary of Agriculture.*

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Agricultural Gazette of New South Wales.

Fallowing Competitions, 1923-24.

Eugowra P.A. and H. Association.

W. D. KERLE, Senior Agricultural Instructor.

THE second annual fallowing competition conducted by the Eugowra Pastoral, Agricultural, and Horticultural Association was judged on 25th and 26th March. Seven competition blocks were submitted, a number of others having been withdrawn owing to weed growth, &c. The competition was for the best 50 acres of fallow land within 15 miles radius of Eugowra, two prizes being offered.

For the sake of uniformity the scale of points adopted for last season was again employed, viz. :—

	Maximum Points.
Moisture content	30
Condition of mulch	30
Freedom from weeds	30
Consolidation of subsurface	30
Thoroughness of cultivation	30
Total	150

The rainfall recorded at Eugowra Post Office for the fallowing period was :—

1923		1924.	
July	271 points.	January ...	60 points.
August ...	104 ,,	February ..	253 ,,
September ...	357 ,,	March	Nil.
October ...	121 ,,		
November ...	140 ,,	Total ...	1,392 points.
December ...	86 ,,		

Several of the fallows experienced a very heavy rainstorm in the middle of February, which caused considerable washing away of the soil. Strong winds in October and abnormally high temperatures in January had also to be contended with.

The details of the awards are as follows :—

Competitor.	Moisture.	Mulch.	Weeds.	Consolidation.	Cultivation.	Total.
F. Mulligan, Woodlands, Eugowra ...	26	24	28	26	25	129
N. G. McMillan, Marara, Eugowra ...	$24\frac{1}{2}$	24	$29\frac{1}{2}$	23	[illegible]	[illegible]
A. Chatman, Trajere	22	21	27	23	[illegible]	[illegible]
G. H. Pengilly, Wimmera, Eugowra ...	19	22	27	14	20	102
J. T. Noble, Sunnyside, Eugowra ...	14	23	28	12	24	101
A. R. Bowes, Trajere	19	22	24	14	22	101
L. E. Thurtell, Nyrang Creek	18	13	28	14	18	91

A

Details of Fallows.

F. Mulligan.—The paddock, originally timbered with pine and box, was cleared eight years ago and had had five crops. The soil was a light red loam with a clay subsoil, typical of the Meadowbank lands to the south of Eugowra, and eminently suitable for wheatgrowing. The fallow was an excellent one, and showed ample evidence of thorough cultivation. It was ploughed in July–August, 1923, with the mouldboard, 4½ inches deep, harrowed in September, one-wayed in January, and springtoothed late in February. Sheep were on the fallows until the end of the year.

The rainfall on the fallow was 12½ inches, and included a heavy downpour on 16th February, when over 3 inches of rain fell.

The moisture content of the fallow was excellent, and the mulch, although too heavy and rough in places, was for the most part even and in a nice "small clod" condition. The consolidation of the subsurface was excellent, due to working at the correct depth and to judicious grazing with sheep. It was very free from weed growth, only a little wild melon being present. The straightness, evenness, and general thoroughness of the cultivations, and condition of the headlands were features of this fallow.

N. G. McMillan.—The block was a heavy loam with a clay subsoil, which had been cleared for some years. The fallow was an excellent one, showing practically no weed growth and particularly well and evenly cultivated. It was mouldboard-ploughed early in September, 1923, 5 inches deep, springtoothed in November and twice in March. Sheep were lightly grazed on the fallows.

The rainfall recorded from ploughing until 18th February was 10·17 inches, none having fallen afterwards.

The chief defect in this fallow was insufficient consolidation, brought about by springtoothing too deeply in the March cultivations. This caused the moisture to be conserved at too great a depth, and the mulch to be too heavy and in places too rough. The moisture content of the subsoil was satisfactory. A few thistles were the only weed growth, and the uniformity and straightness of the ploughing and subsequent workings was noteworthy.

A. Chatman.—The area entered by this competitor was a red basaltic loam overlaying a clay subsoil, and with a medium slope to the west. It received the full force of the heavy rainstorm in the middle of February, which caused a number of washaways. It was ploughed in July, 4 inches deep, with the mouldboard, disced in October, harrowed early in November, disced in February, and springtoothed the second week in March.

This fallow was of a patchy nature, and should have contained more moisture. The mulch was fairly uniform in depth, but for the most part too fine. The subsurface was in the main nicely compacted, but in places was too solid. In a few patches weed growth was fairly bad, but except for a few melons the major portion of the paddock was very clean. Channels and lack of

thoroughness and straightness in the cultivations occasioned loss of points. Considering the harm wrought by the storm in February, this fallow was in a very creditable condition.

G. H. Pengilly.—This fallow was ploughed 3 inches deep in July with the mouldboards, springtoothed in October, harrowed in January, and cultivated again at the end of February. The rainfall on the fallow was 9·59 inches. The soil is of a sandy nature, and totally different to any others in this competition. It varies considerably from red to white in colour, and just as widely in its physical condition. Such a soil presents much difficulty from a fallowing point of view, and the fallow inspected showed considerable variation in moisture content, compactness of subsurface soil, and implement workings.

While portions of the block showed splendid moisture just below the mulch, particularly the red sandy loam, others showed very little moisture, especially the light-coloured patches.

The consolidation was for the most part shallow and inclined to be too solid.

The cultivations were not of uniform depth and lacked thoroughness. Weed growth was not much in evidence and consisted chiefly of melons.

J. T. Noble.—This is a paddock which had been under cultivation for many years, and for the most part consisted of a light red loam. The fallow is more or less an experiment of Mr. Noble's, who has had excellent yields from shallow cultivation. The fallow was not ploughed, all workings being with the cultivators—the first in September with the disc, the second in January with the springtooth, and the last with the same implement in mid-March, all workings to the depth of 3 inches. Mr. Noble is aiming at destruction of weed seeds in the top 3 inches of soil, and endeavouring to improve the biological condition of the soil rather than to conserve soil moisture.

The fallow was very free from weeds and had an even mulch but had very little moisture or consolidation. Sheep were running on the fallows up to the end of last year, and were responsible for bringing about a certain amount of compaction below the mulch. The rainfall from first cultivation to time of judging was 10·17 inches, including 2·13 inches from 16th to 18th February. Following this heavy fall the ground was not cultivated for four weeks, in which time much of the moisture had been lost. The cultivations were of uniform depth and straightness; headlands were economically worked.

A. R. Bowes.—This was a red loam of basaltic derivation, similar to Mr. Chatman's, but with very little slope. It was ploughed 4 to 5 inches deep in July, and owing to heavy growth of oats again in September. It was disced in January and springtoothed early in March.

The heavy rainstorm referred to was very heavy here. The time that elapsed between this storm and the cultivation in March was detrimental to moisture conservation. The fallow was very patchy and should have contained much more moisture. The mulch was uneven in depth and loose, and for the most part too fine. The subsurface was much too loose, owing to too deep working with the springtooth in the last cultivation.

The workings were straight and the headlands well cultivated. Melons were practically the only weed growth and were sprinkled throughout the fallow.

L. E. Thurtell—This block was at Nyrang Creek, 13 miles from Eugowra, and seven from Canowindra. It was a very nice red loam soil, with a clay subsoil, and practically level.

The fallow was worked irregularly, portion ploughed in July and the rest in September, 4½ inches deep, with the mouldboard; harrowed in November and January, and springtoothed, portion first week in February and remainder second week in March. Sheep were grazed until the November harrowings.

The only redeeming feature about this fallow was the very little weed growth. The rainfall on the fallow was approximately 10 inches, including a heavy fall on 18th February. This storm completely destroyed the mulch, which had been restored only on about one-third of the block, and that not until three weeks after. Most of the block, therefore, presented a caked, cracked surface, and showed considerable loss of moisture. The portion springtoothed in March had a fair mulch, but the working had been too deep, and much of the consolidation had been destroyed. Moisture was present in the subsoil, but not to any extent in the surface soil. The cultivations had not been thorough, many hard patches showing through. The benefits of fallowing were, in this entry, nullified by the neglect to work the ground thoroughly, in the right manner, and at the right time.

Remarks.

It is generally accepted that the practice of fallowing for wheat to secure high yields is essential, but opinions differ among farmers as to the best methods to adopt to obtain the maximum benefit. This question largely hinges on another—what constitutes an ideal fallow?

The objects of fallowing are, briefly, to conserve the moisture and to improve the chemical and biological condition of the soil. These processes are regulated primarily by the physical condition of the soil, and it is according to their effect on this condition that the efficiency of tillage implements can be gauged. Certain soil conditions are known to be the most effective in controlling the capillary movement on which the distribution of soil moisture largely depends. Water moves in all directions in the soil, on the principle of capillary attraction, and the rate of movement is influenced by the mechanical condition of the soil.

In many ways the farmer makes use of the principle of capillary movement, and many of his tillage implements are designed to effect capillarity.

To prevent the moisture which rises by capillarity to the surface from being lost by evaporation, mulches are essential, and to promote the movement of moisture from the subsoil to the soil immediately below the mulch it is essential that this portion be compacted.

It appears, therefore, that for the conservation and circulation of soil moisture an ideal fallow is one which is kept effectively mulched, and in which the subsurface soil has the right degree of consolidation. The latter is brought about by the working of suitable implements, by the manner in which rain falls, and by the firming effect of sheep in grazing. It is most often ruined by too deep working with the cultivators or other implements. The mulch, which to be effective should be at least 2 inches in thickness, should not be too fine, the most satisfactory being that produced by spring-toothed implements.

Many questions arise in the management of fallows, and tillage operations must necessarily be influenced by weed growth, &c.

In general, observations indicate :—

1. That the land should be fallowed earlier.
2. That more frequent use of the harrows should be made, as they do not injure the consolidation as the deeper working cultivators may do.
3. That ploughing and cultivations are often too deep, particularly the latter.
4. That weed growth should be destroyed when very young with the harrows, as when weeds are well grown implements have to be used which, though destroying the weeds, often do so at the expense of the mechanical condition of the fallows.

Corowa P. A. and H. Society.

E. S. CLAYTON, Agricultural Instructor.

As portion of its growing crop competitions, the above society conducted a fallow competition this season, the scale of points allowing 30 points each for moisture content, condition of the mulch, freedom from weeds, consolidation, and cultivation, making a total of 150 points. The area submitted had to be at least 150 acres.

Judging took place on 1st, 2nd, and 3rd April, twenty-seven fallows in all being inspected. It was unfortunate that the fallows were not judged before the recent rains. Had that been done the effectiveness of the different mulches would have been more evident.

The aim of the society in conducting a combined fallow and growing crop competition is to improve the farming methods of the district, and so to bring about an increase in the wheat yields. A keen interest was taken in the judging by most of the competitors, who were particularly anxious to learn in what way their fallows could be improved.

The fallows in this district compared very favourably with those in other parts of the Riverina; in fact, as far as freedom from weeds was concerned, these fallows were, perhaps, the best throughout the southern and Riverina districts, which reflects great credit on the locality, particularly as the season was so favourable to weed growth.

In the Corowa district, as in most of the recognised wheat areas, fallowing is now regarded as absolutely essential to profitable farming, and there is no doubt that the general adoption of fallowing has been responsible for a considerable increase in wheat yields; but if yields are to be still further increased, a great deal of improvement must take place in the direction of rendering the fallowing more effective.

In fallowing the main object should be to conserve as much moisture in the soil as possible, to germinate and destroy weed seeds, and to bring about the consolidated seed-bed which is so necessary for the growth of wheat. Most farmers now understand how to conserve moisture in the soil by maintaining a fairly cloddy surface mulch of about 2½ inches, so that evaporation of soil moisture is effectively checked. Unfortunately, consolidation is not so well understood.

The importance of the consolidation of the sub-surface soil, *i.e.*, that section of the soil between the loose dry surface mulch and the ploughing depth, is not fully realised. It is this consolidation which enables the moisture in the soil to move upwards (under the influence of capillarity and surface tension) to the higher levels, where it is available to the wheat plants. For this movement of moisture to take place it is necessary that the soil particles be packed closely together. The judicious cultivation of the fallows, the weight of the horses, of the implements, and of stock grazing over the land, and the natural settling of the soil, all assist in the consolidation of the seed-bed.

While deep ploughing has a sweetening effect and results in more plant-food becoming available, it also renders the consolidation of the seed-bed much more difficult, and for this reason deep ploughing is not advisable. A number of the fallows inspected were ploughed too deeply—some up to 6 inches. There is no necessity to plough deeper than 4½ inches. An occasional variation of half-an-inch in the ploughing depth is quite sufficient to preclude any possibility of the formation of a hard-pan.

To obtain the best results the ploughing should be done as early as possible. In the early cultivations of the fallow one of the aims should be to bring all the clods to the surface, allowing the finer particles of soil to fall below. For this purpose the springtooth and rigid-tine cultivators are useful implements. It is necessary that these early cultivations should be sufficiently deep to ensure that no clods are left below the surface, where they would cause air spaces and interfere with the consolidation of the seed-bed. It is advisable to get off the cultivator occasionally and closely examine the work as it is done.

All subsequent cultivations of the fallow should be no deeper than 2½ inches. In many of the fallows examined buried clods were found, while in some other instances the fallows had been cultivated too deeply.

Sheep were used on the fallows in practically every instance, and it is pleasing to record that, in spite of the season being so favourable to the growth of weeds, the disc cultivator was used on only a few of the fallows.

While this implement is undoubtedly effective in destroying weeds, it unfortunately creates too fine a surface, which runs together too readily after rain. Most of the fallows were worked with harrows and springtooth cultivator. On a few the skim plough had been used, and with good effect.

On account of the recent heavy falls of rain all the fallows were well supplied with moisture, and full points were in each case allotted. A number of the mulches were rather too fine, and of course ran together after the rain, while those fallows on which a cloddy mulch had been maintained were in a much better condition. One great advantage of the recent rain is that there is now a good germination of weeds, particularly capeweed, on most of the fallows. These young weeds can now be easily destroyed by cultivation, and drilling can then be carried out in a comparatively clean seed-bed.

DETAILS of Leading Awards.

Competitor.	Moisture.	Mulch.	Consolidation.	Freedom from Weeds.	Cultivation.	
R. S Kinnear	30	15	24	27	21	117
W. Davis	30	15	22	29	20	116
W. and O Field, and H. Hay and Son.	30	26	12	28	18	114
J A. Davis	30	15	22	27	20	114

It speaks well for the Corowa district that the competition drew so many entries, and that the fallows reached such a high standard. As good fallowing is essential to the production of good crops it would be of advantage to the southern and Riverina districts if some of the other agricultural societies were to follow the good example set by the Corowa P. A. and H. Society, by conducting similar competitions.

THE CO-OPERATIVE MOVEMENT IN SOUTH AFRICA.

RECOGNISING the paramount importance of co-operation to the farming community, the Government has encouraged the principle for many years past. In 1905 loans were provided for the establishment of co-operative associations of wine and agricultural farmers, and although the scheme was not a success the movement was started, and notwithstanding individual failures (principally owing to bad management and an absence of the true co-operative spirit) has steadily gained ground. . . . . .

In 1922 the Co-operative Societies Act was passed, regulating the formation, registration, and management of co-operative societies and companies (with either limited or unlimited liability) in the Union. This Act now forms the basis of organisation of the Division of Co-operation. The Division assists farmers to form co-operative societies, and thereafter endeavours to ensure that such societies are conducted along the right lines. . . . . .

There are at present some 170 of such societies (with a membership of about 31,000), most of which are formed for the purpose of marketing a particular crop, such as maize, tobacco, fruit, wine, cotton, wool, eggs, cheese, &c.—*Journal of the Department of Agriculture, South Africa.*

Ploughing v. Cultivation after Maize in New England.

A practice fairly common on New England farms is to follow a crop of maize by oats (usually White Tartarian), or, to a lesser extent, by an early-maturing wheat such as Florence, in each case planted in July or August of the same year as the maize harvest. The latter is as a rule completed about June, and a rush then ensues to get the ground ploughed and worked down to a suitable seed-bed for the winter cereal.

If the maize crop has been properly inter-cultivated to keep down weed growth, the soil on most New England farms is usually in a friable granular condition to a depth of several inches, with a good supply of moisture beneath. It, therefore, seems doubtful whether, under these conditions, re-ploughing is necessary. To test the point over a number of years, a simple trial was commenced at Glen Innes Experiment Farm in 1920, and has been carried on during subsequent seasons. The test has been conducted on land which had previously been cropped with maize, and equal areas have been (1) re-ploughed, (2) cultivated with a one-way disc-cultivator.

So far the results show that in a normal season, provided that the inter-tillage of the maize crop has been thorough, no advantage is to be gained by re-ploughing, but that a substantial saving may be effected by omitting the operation.

The average value of produce from each plot for the period is as follows:—

Ploughed, £6 6s. per acre.
Cultivated, £6 4s. 9d. per acre.

After deducting the cost of ploughing at 9s. 6d. per acre in the one case, and of cultivation at 2s. 6d. per acre, the average gross returns are—

Ploughed, £5 16s. 6d. per acre.
Cultivated, £6 2s. 3d. per acre.

It will, therefore, be seen that a slight advantage is gained by cultivation instead of re-ploughing over a period of years. In some years, of course, seasonal conditions may be against a farmer to such an extent that weed growth in the maize crop renders ploughing absolutely essential to the preparation of a suitable seed-bed for the following cereal. The object of the experiment (which will be carried on for a further period) is, however, to demonstrate that a considerable saving in time and money may be effected by the exercise of discretion as against the following of a stereotyped procedure.—R. G. Downing, B.Sc. Agr., Senior Experimentalist.

The Demands of Modern Farming.

Whatever may or may not be done by Government, it is perfectly clear that the success of the individual farmer will depend on his own efforts. That he must work hard goes without saying, but under present conditions it must be work with the head as well as the hands. The crops to be grown and the kind of farming to be followed must be determined, not alone with an understanding of the conditions which influence production, but with some knowledge of the prospective demand for these crops and some study of the conditions which are likely to influence the price.—Extract from the Report of the United States Secretary of Agriculture.

Farmers' Experiment Plots.

Wheat and Oat Experiments, 1923.

Western District (Parkes Centre).

H. BARTLETT, Senior Agricultural Instructor.

The undermentioned farmers co-operated with the Department in conducting trials during the season 1923:—

J. Hobson, "Araleun," Bogan Gate.
J. M. Connor, "Kokum," Ootha.
Mailer Bros., Trundle Park, Trundle.
F. W. Giles, "Jessiefield," Parkes.
E. A. Draper, Harris Park, Alectown West.
J. S. Plowman, Emu Vale, Parkes.
W. W. Watson, "Woodbine," Tichborne.
Hughes Bros., "Greenacres," Pullabooka.
E. J. Allen, Gregra.
R. J. O. Berryman, "Avismore," Botfield.

The Season.

The results are not as satisfactory as might have been expected in view of the rainfall registration, as with a rainfall of from 10 to 16 inches during the growing period yields should range from 20 bushels per acre upwards. Owing to the previous dry year, the wheat lands of the western district carried a low moisture content in the subsoils at sowing time, which meant that the crops were almost wholly dependent upon the rainfall of the growing period; the reserve of moisture which carries a robust crop over the dry periods which sometimes occur in October was absent. This shortage, associated with strong drying winds in late September, and followed by a dry period of four weeks (until the last day of October), reduced ten-bag prospects to ten-bushel crops.

Rainfall during Growing Period.

	Parkes Post Office.	Trundle (Mailer Bros.).	Tichborne (W. W. Watson).
1923.	points.	points.	points.
May	78	49	83
June	466	336	349
July	346	200	187
August	92	54	46
September	133	174	134
October	245	233	132
November	254	90	80
Total	1,614	1,136	1,011

The early wheats suffered most severely, as they were caught just about when the grain was forming. Late-sown crops, being not so advanced, were

injured less, and there is an instance of Canberra wheat scratched in on new land in July yielding six bags per acre, due to the mild weather and opportune rains of November and December. The farmer is well pleased with the result, but he does not intend to make a practice of late sowings recognising that only in unusual seasons are they profitable.

Condition of Land and Growth.

In every case the plots were sown on fallowed land, which had been well worked, and was thought to be clean. Sowings were made about the middle of May, using from 45 to 55 lb. of seed, and from 40 to 60 lb. of superphosphate per acre, according to the locality. Germination did not take place till after the early June rains, and growth was somewhat slow until the end of August. The growth was good until the middle of September, when the adverse conditions had the effect explained above. Weeds (chiefly wild mustard) adversely affected some plots, appearing in land which had been clean for several years.

The Wheat Trials.

The yields in the wheat variety trials were as follows :—

RESULTS of Wheat Variety Trials.

Variety.	Gregra	Pullabooka.	Parkes (J. S Plowman)	Alectown West	Parkes (F. W. Giles).	Botfield.	Trundle.	Gotha.	Pogan Gate.
	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus. lb.
Canberra (no manure) ...	13 55	20 45	13 26	2 11	1 45	10 47	5 51	5 32	2 52
Canberra (manured) ...	24 28	28 9	16 46	6 32	2 42	15 7	6 55	7 36	3 59
Gresley	21 28	17 16	12 5?	5 48	2 5		5 45	5 42	4 16
Hard Federation	11 33	23 54	14 58	3 24	4 33	13 1	6 40	5 36	..
Federation	10 29	29 28	12 22	1 1	5 57	8 6	...	3 55	..
Marshall's No. 3	15 12	11 55	11 6	7 30	0 52	10 52	...	3 21	...
Yandilla King	17 19	..		...	...	.	3 19	..	0 36
Waratah	...	8 41	5 14	6 12	1 9	7 58	...	.	...
Union	...	..	10 12	...	...	...	...	..	...
Wandilla	..	..	7 41	...	...	...	...	...	1 23
Plowman's No. 3	..	...	11 6	...	...	...	...	...	...
Plowman's No. 137 ..	...	...	14 45	...	..	...	...	...	..
Plowman's No. 110 .	...	...	10 59	...	..	...	...	...	..
Clarendon	.	...	...	9 59	4 26	...	9 4	6 41	5 4
Imp. Steinwedel	...	...	...	...	1 51	...	...	..	...
Florence	...	...	...	...	...	11 52	.	...	...
Warden	...	..	...	...	...	...	4 22	..	...
Firbank	...	...	...	...	...	...	..	3 36	1 58

Owing to the exceptional seasonal conditions and low yields, it is hardly possible to compare the values of the varieties. Federation yields were generally low, but it must still be recognised as the standard variety. Canberra still holds its place as a consistently high-yielding early wheat, and although it appears to be disease-liable the economic aspect is compelling the introduction of disease-control methods rather than the elimination of the variety.

Clarendon is still attracting attention, mostly in the districts west of Parkes, and several centres are apparently justified in making it one of the commercial varieties. Waratah is unfortunate in that it has shown poor germination in the past two years, but as this has probably been due to harvest injury and bluestone, it is possible that with the use of copper carbonate better results will be secured in the present season. Indications are in its favour from a yielding point of view, and it is certainly worth further trial.

Mr. Plowman, of Parkes, has several useful wheats which he has bred and selected, but he is desirous of being certain that they will give better results than the present commercial wheats before distributing them.

The reputation of the later wheats, such as Yandilla King, Turvey, and Currawa, has suffered in the past two years, mainly owing to the lateness of the autumn rains shortening the growing season, with the result that tipping occurs in October. The general tendency is to eliminate such wheats, which is hardly a wise policy. Provided they are above ground by the end of April, these wheats yield better than the early sorts.

Fungicide Experiments.

Two trials with fungicides were carried out during the past season. The one at Coradgery gave yields greatly in favour of the copper carbonate treatment of seed, while at Trundle the bluestone-treated seed gave somewhat the higher yield.

Observations indicate that the use of copper carbonate ensures an earlier and thicker germination, and is effective in controlling bunt.

Variety and Treatment	Mailer Bros. Trundle.		F. W. Giles, Parkes.	
	bus.	lb.	bus.	lb.
Federation treated with bluestone	7	11	5	57
Federation treated with copper carbonate.	5	17	9	12
Hard Federation treated with bluestone.	....		3	51
Hard Federation treated with copper carbonate.	......		4	11

The Oat Trials.

Oats are becoming more popular in the west, no doubt owing to the part they must play in the control of fungus diseases, and the supply of winter feed for fat lamb raising and grain for working horses. The inquiry for seed oats this year was greater than the supply, especially for such sorts as Sunrise, Lachlan, and Mulga. Lachlan can be recommended as a grain oat, while Sunrise and Mulga are most suitable for grazing, silage, or hay. Algerian can only be recommended for the more eastern centres, such as Molong, as its longer growing period makes it a risky variety in the warmer centres.

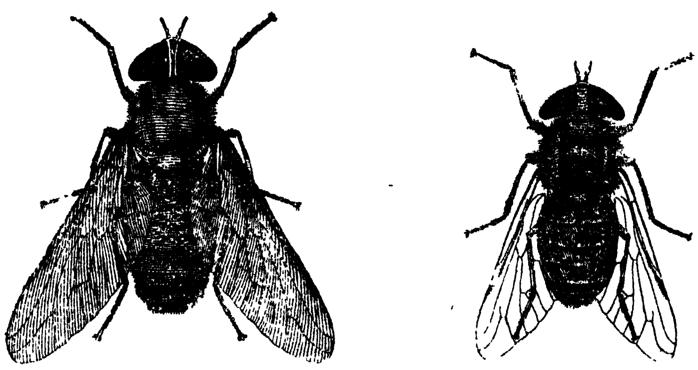
The yields in the oat trials were as follows:—

RESULTS of Oat Variety Trials.

Variety.	Gregra.	Tichborne.	Botfield.	Trundle.	Bogan Gate.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Sunrise	17 29	18 3	13 18	5 23	13 34
Mulga	15 34	17 34	20 3	6 21	12 11
Algerian	38 1	3 3	15 13	9 0	3 35
Fulghum	......	15 38	.....	.....	....
Lachlan	......	5 1	.. ..	......	..

SPECIMENS OF "BITING" FLIES WANTED.

SPECIAL investigations are being conducted by Dr. G. Sweet and Dr. H. R. Seddon, on behalf of the Commonwealth and State Governments, into a certain stock disease, the causal organism of which is believed to be carried by March flies or "biting" flies. It is important, therefore, that exactly what biting flies are present in Australia should be known, and the help of persons willing to forward specimens from any part of the State is invited. The greater the number and variety of flies and the greater the range from



March Flies or "Biting" Flies.

which they are collected, the more valuable will be the information gained. The accompanying illustrations indicate the type of blood-sucking flies referred to.

The specimens, which should be damaged as little as possible, may be sent in a tobacco tin with a few pieces of crumpled paper to keep them from shaking about. Postage stamps should be fastened, not on the tin or box, but to a label attached by string. The Department would be very glad to acknowledge such specimens and to afford any information desired in relation thereto. In forwarding, the place where caught, date, name and address of sender, &c., should be stated. The package should be addressed to the Government Entomologist, Department of Agriculture, Sydney.—W. B. GURNEY, Government Entomologist.

Wheat-growing at West Wyalong.

MODERN METHODS IN PRACTICE.

W. H. BROWN, Editor of Publications.

FALLOW—surface cultivation—consolidated seed-bed. To the understanding ones those few words convey the recent history of soil methods in relation to wheat-growing in New South Wales.

It is only ten or twelve years since the question, "What is this fallowing, anyway," was on the lips of hundreds of farmers. Hardly had the answer become commonly known than the necessity for the cultivation of the surface to preserve the advantages of fallowing began to attract attention, and an officer of the Department of Agriculture was led to remark that "the wise practice of ploughing in the winter or spring preceding sowing is becoming more general, but it is seldom that the soil is given the attention during the summer that it should have." In this respect, too, ground has been won in recent years and neglected fallows are now far less common than they were. Opportunity for still further advance seems to be opening up as the value of a firm, compact seed-bed comes to be recognised by good farmers as well as by field officers of the Department of Agriculture.

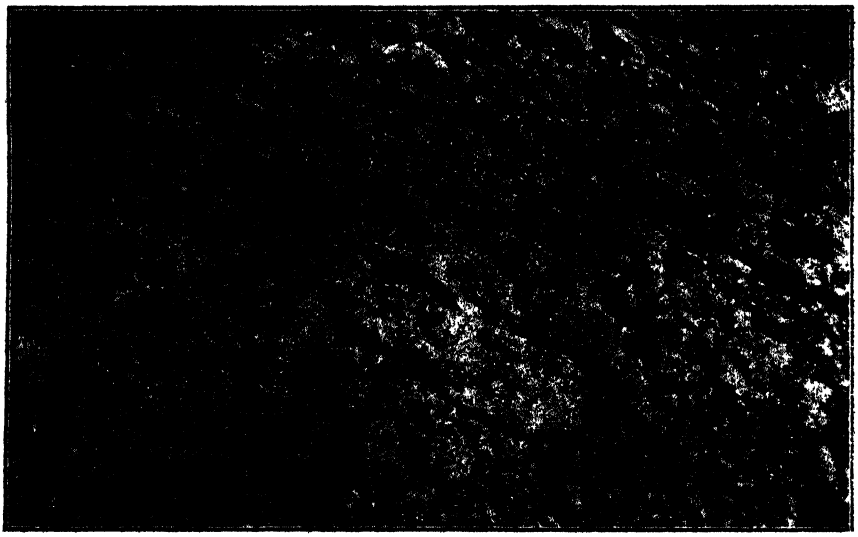
It was in this last respect that the methods of Messrs. D. and J. Gagie, well-known wheat-growers near West Wyalong, proved most interesting during a short visit to their district last month. From the practice of fallowing to the regular working of the surface, and from the cultivation of the surface to a system that produces an ideal seed-bed, they have proceeded step by step, and with such success that their fallows are certainly most suggestive and valuable as object lessons to other farmers. It is not too much to say that few farms in the State could point to soil conditions like those under which wheat had just been planted.

On one paddock sown exactly a week before, the grain in all directions was found sprouted a couple of inches, and when the soil was drawn aside and the little plants carefully dug up the roots were 2 to 2½ inches long, notwithstanding that the surface was quite dry and that not a drop of rain had fallen since sowing. Such a thing could only occur where the soil conditions below the surface were highly favourable. And so they were here. The surface consisted of loose, dry clods of varying sizes, and just below them a bed of fine, firm, moist soil, lying in compact, close contact with the unworked soil below the plough sole. "It's no use trying to grow wheat unless you lay down a good foundation," said Mr. D. A. Gagie, and in his view a proper foundation is just such a seed-bed as we have described. How the condition is produced was the subject of conversation for nearly two days.

The Farm Itself.

The Department's interest in "Spy Hill" goes back nearly fifteen years. It was one of the first farms on which farmers' experiment plots were conducted by the Department (commencing in 1910), and experiments are still planted there every year.

The farm comprises 3,600 acres of a red loam, which for the most part is of a free-working texture, but with patches of stiffish clay at one extreme and of sandy loam with a heavy clay only 5 or 6 inches from the surface on the other extreme. The property is fully equipped with commodious buildings, and is subdivided into paddocks large and small. From 2,000 acres to 2,400 acres are put under wheat every year—nearly half of it by share-farmers—and 500 to 800 acres are fallowed annually. Sheep have long since



Section of a Wheat Paddock at "Spy Hill," West Wyalong.

This surface is regarded by Mr. D. A. Gagle as too cloddy.

found a place in the farm's economy, and from 1,000 to 2,000 can always be seen there. They are valued not only for their direct returns, but for the way in which they can be worked in conjunction with wheat-growing.

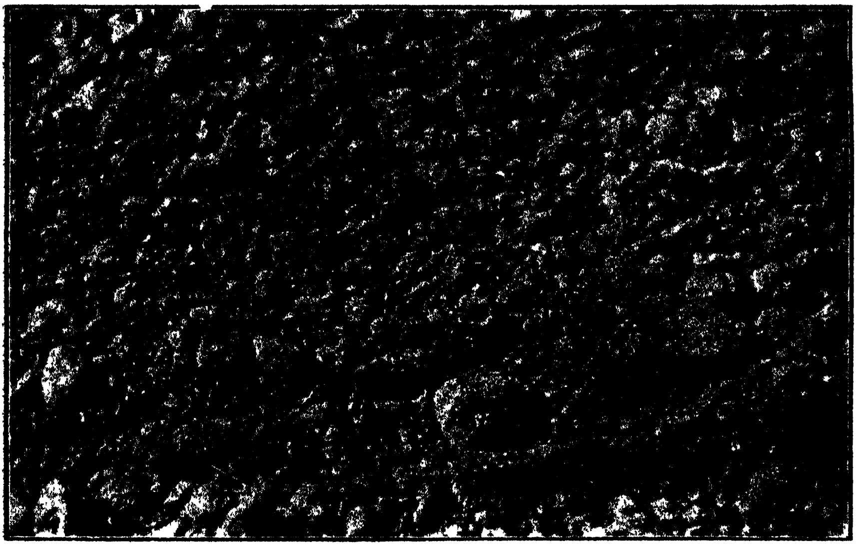
In that simple relation of its features, the farm is not very different, perhaps, from many others, but the means by which it is worked and by which the foundation of a profitable crop is laid down, are capable of application—at least in principle if not in detail—on many thousands of acres in this State.

The Foundation of Successful Wheat-growing.

At the outset these farmers insist upon a thorough working of the soil for the fallow. There must be a complete inversion of the top 4½ to 5 inches of

soil (not less), all weed growth must be properly buried, the soil should be open so as to admit air and moisture, and the plough sole must be left firm and smooth, but not ridgy and impervious to water. Because it does all this best, the mouldboard plough is exclusively used in breaking up the land for fallow— in fact, disc implements have hardly any place in the farm programme. Much is attached, of course, to the need for the land being in good condition for the first ploughing. To break up well it should be fairly moist, and though occasionally work has to be delayed owing to absence of rain, it is usually possible to start fallowing in June or at least in July.

The surface is left untouched in the rough until September, when the operation is undertaken which distinguishes the methods of the farm and makes possible that ideal consolidation of the subsurface soil to which so



Another section of a Wheat Paddock at "Spy Hill."
This is considered ideal "cloddiness."

much importance is attached. This consists of a working with the spring-tooth cultivator—but not 2 or 3 inches deep; that would merely disturb the surface and leave the soil beneath still in a rough, uneven state. The cultivator is put down the full depth of the plough, so that the whole of the clods in the worked soil—whether near the top or near the bottom of the ploughing—are brought to the surface, while the fine soil is sifted to the bottom, forming a layer of a couple of inches of friable material ready to pack together. In such conditions the close connection which formerly existed between the subsoil and the surface, but which was broken by the ploughing, can be renewed, while on the surface lie the clods, large and small, which have been brought to the top.

A Perfect Seed-bed and a Comparison.

What an ideal condition has now been produced for a seed-bed can easily be seen. All that is required is time to allow of consolidation to take place below, and surface working to prevent the top soil from becoming caked together, and yet from becoming worked down so fine that it will be lifted by the drying winds that sweep over this country in spring.

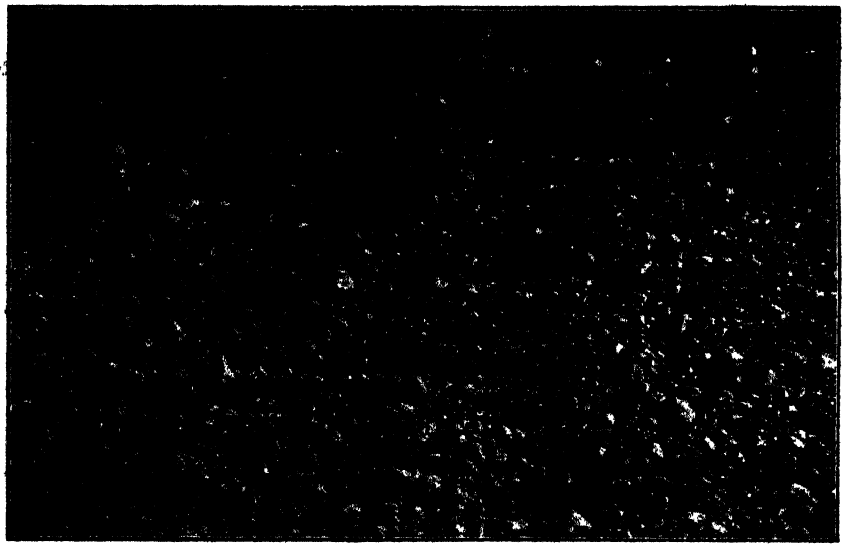
This is just what these farmers proceed to ensure. By several applications of the springtooth cultivator (say, in November, January, and just before sowing) the surface is kept loose, but the fine soil is never again disturbed. The traffic of these cultivations, the trampling of the sheep, and the action of rain all help to compact the soil below, until we have the perfect seed-bed that produced the quick germination referred to early in this article.

A Fine Surface at "Spy Hill."
This is too fine, according to Mr. Gagie.

"But could not such a state of affairs have been just as well produced in some other way," it will be asked. Perhaps it could, but let the questioner suggest the way. The primary necessity is the removal of all clods from the subsurface soil. A consolidated condition cannot occur if clods as turned over by the plough are allowed to remain below. Walking on to a newly-sown paddock not a great distance from "Spy Hill," we found positive demonstration of this. Here the first ploughing had been done with the disc plough and the surface had then been worked several times with harrows and scarifiers. These operations had never been more than a couple of inches deep, and consequently the coarser lumps and clods were not brought to the surface. "How can consolidation take place here," Mr. Gagie asked, bringing to the top clods that were 3 and 4 inches deep and that still bore

the marks of the disc. Below all such clods were crevices and cracks admitting air and allowing moisture to escape, while the remains of undecayed vegetation, just as they had been turned down, could be found underneath—abundant evidence that eight months had not been enough for decay to take place under such unfavourable conditions.

Notwithstanding that the land had been fallowed, and that the surface had been worked several times, this farmer was still dependent on the rainfall for germination. Nor was that all. Presently drying winds will come with spring and early summer and the soil in its open condition will continue to lose the moisture that should be going to the crop.



Another Fine Surface.

This was taken from further off than the other three photographs. It illustrates portion of a headland which has become too fine as a result of too much working.

A Cloddy Surface.

It will be gathered that a cloddy surface—so much talked of a few years ago—is distinctly favoured on "Spy Hill." In varying sizes clods literally cover the paddocks. It is not possible to obtain uniformity on all soils, of course, but there is a condition of "cloddiness" that is regarded as the optimum, and that is never lost sight of. The accompanying photos, taken by Mr. J. Gagie on a paddock which had just been sown and which was beginning to "green" in places, give some idea of these farmers' objective.

Referring to the disc implements used by many farmers, Mr. D. Gagie remarked that they would put the clods down below, but they would never bring them to the surface, "and with unbroken clods in the soil it is impossible to get a proper foundation."

The Best Implements for Weed Control.

Far too commonly disc implements are used because weeds have been permitted to take possession of the fallows. But there are better means and more profitable ones for that purpose. There are sheep. With a small flock on the farm the material that has to be destroyed by horse and manual labour can actually be turned to profit without any outlay at all. Mr. Gagie mentioned a line of 300 sheep which he bought off-shears last September at 20s. 10d., just as the fallowing of one of the paddocks was finished. At that time weeds were showing quite green on the ground, and the growth through the summer was good enough to maintain the sheep for six out of eight months. In the odd two months they were grazed on stubble and on another fallow paddock, and in the early part of May they were about ready for sale at approximately 35s. A profit of 14s. per head on 300 sheep, made out of growth that otherwise would have had to be killed, is surely a sound argument in favour of sheep on the wheat farm. These farmers think so anyway, and when shorn sheep appear on the market early next spring they will be found buying in again in view of the feed the fallows are sure to afford in the summer.

So far fat lamb raising in a specialised way has not been attempted, and the Merino is the present preference, though crossbreds are used on cultivation. Feeding off growing crops in the winter is not attempted, it being considered unsafe for a district with an 18-inch rainfall.

What has been said sufficiently indicates that Messrs. D. and J. Gagie attach the greatest importance to methods that will produce a good soil texture. "We fallow to conserve moisture, of course; fallowing certainly does that. But we like fallowing, too, because it enables the right soil condition to be built up." On the portion of the farm which they work themselves they fallow once for every two crops, though occasionally three crops have to be sown before it is convenient to fallow again. It is not so many years since they started the practice, but they have taken careful note of the results and are satisfied that it is not only profitable in increasing the yield, but it conserves the farm in good heart, and also makes more convenient working. The bleak winds of the western plains make it necessary to stable-feed the horses in winter, whether they are in work or not, so they may as well be fallowing as doing nothing. A slight reduction in team strength under fallowing conditions has been possible, but, we were told, "It is a mistake to attempt farm work without team strength."

The method adopted for working up stubble land preserves the principle of a cloddy surface and a fine subsurface. The stubble is burned off early, and if there is summer rain the land is mouldboard-ploughed. If the weather is dry, the land is spring-toothed a couple of times, and then once again before sowing. The disc or the springtooth cultivator may be used before drilling, but it is regarded as important that the land shall be worked as early after burning off as possible.

Something about Varieties.

Turning now from actual soil methods, it may be said that these farmers take a good deal of interest in varieties of wheat and in their comparative values for milling qualities. They grow quite a number of varieties, and are important competitors at the Royal Agricultural Society's Show in Sydney almost every year. At the show just concluded they were conspicuous winners in the wheat sections, and they await the reports of the milling tests with great interest. Every new variety that is likely to suit the conditions is tried on the farm, and sometimes quite fancy prices have been paid for seed in the desire that nothing likely to prove good shall be missed.

This interest in varieties is naturally associated with an appreciation of the proper way to handle them. Each variety is sown in its proper season, and the sowing season is divided into three periods—early, midseason, and late. Long season varieties have always done well on the farm, and sowings are made up till 1st May of Turvey, Dart's Imperial, Yandilla King, and Major. In the midseason, running from 1st to 14th May, Federation (which still occupies the largest area of all), Gresley, Florence, Cedar, Petatz Surprise, and Union are planted, and in the late sowing period (15th May to 1st June) Waratah and Canberra have their turn. When other minor varieties are added, the programme looks a diversified one, but of a number only limited areas are planted. Gresley has done consistently well, and is now regarded as established; it is particularly valued for hay, as, of course, is Florence. Union is regarded by Mr. Gagie as most promising. Canberra has been grown for some years and is highly esteemed, but in the last season or two Waratah has been attracting a lot of attention and threatens to rival Canberra in favour for late sowing.

The averages of the yields obtained from a few of the varieties tried on the experiment plots on the farm will be of interest. Only the performances of the past few years have been taken into account in these calculations, and the year 1919-20, which was a complete failure, has been disregarded altogether.

	Average Yield.		Average of Federation in same seasons.	
	bus.	lb.	bus.	lb.
Federation (six seasons)	23	57	...	...
Yandilla King (three seasons) ..	29	36	28	6
Cedar (three seasons)	28	34	24	43
Canberra (six seasons)	25	31	23	57
Gresley (four seasons)	24	54	21	1
Waratah (three seasons)	22	21	19	15

Union, mentioned so favourably above, has only been tried once, but in that season (1923-24), besides presenting good field characters, it gave 26 bushels per acre, as against Federation's 20 bushels 16 lb.

Such yields as the above are in themselves sufficient testimony to the success that attends the farm methods. It would be interesting to know

by how much they exceed the averages of the district in the same seasons, but it must be by 25 to 50 per cent. In the season 1917, when the district average was probably only 10 bushels, one paddock of 300 acres of Federation, after 30 acres had been cut for hay, yielded 2,980 bags of wheat.

The trials on the farm have not by any means been limited to the experiment plots directed by the Department. Each of the wheats mentioned above has been tried on fair areas on the farm, and in each case the experience of the plots has been confirmed.

The plot results when averaged over six seasons indicate that early sowing is slightly better than late, but the season is necessarily the dominant factor.

As might be expected, keen attention is paid to the quality of the seed itself. Better germination, healthier and cleaner crops, better work with the drill, easier harvesting, and absence of weeds from the paddocks all attend the use of good seed, and every bushel sown is graded. "No farm equipment is complete that does not include a grader," we were told.

Disease Troubles.

Bunt does not occur on the farm, but all the seed sown each year is pickled. "We pickle because we value good seed." Up to the present the bluestone solution has been used, but dry copper carbonate is also being tried this year. All the seed on the experiment plots directed by the Department has been treated dry, but in addition a 25-acre block of Federation has been planted on the farm with seed that has been treated in that way, in order that the method may have a field trial.

The only serious disease met with is flag smut, and in one or two seasons it has been responsible for considerable losses. The failure in the season 1919 was due largely to drought, but also partly to flag smut. The year 1922-23 was another in which flag smut was prevalent, and again dry weather was coincident with the disease. In fact, Mr. Gagie thinks the two things are in some degree related. His observations have suggested to him that if rains occur in September flag smut is not seen. Last season Federation and Gresley were sown together under the worst conditions, no rain having fallen since the previous December. The Federation being slower in growth was affected by a spell of dry weather in September, and soon exhibited flag smut. The Gresley, on the other hand, being earlier in habit, was past the stage at which wheat seems most liable to the disease when the dry spell occurred, and it escaped trouble.*

*The Departmental opinion is that weather conditions *prior* to sowing are a very important factor. If the weather is wet for several months prior to sowing many of the flag smut spores will have started to germinate, and there is less chance of infection than if the weather has been dry, in which case at the time of sowing both flag smut spores and wheat germinate simultaneously. The chances of infection under these conditions are increased.

In regard to Federation and Gresley, the latter is an early variety, and generally speaking the earlier a variety matures the less is its liability to be damaged by flag smut.

The Use of Superphosphate.

Superphosphate has a regular place at "Spy Hill," being used at the rate of 50 lb. per acre over the whole farm. The experiment plots afford convincing evidence of the value of this popular fertiliser, as the following table indicates:—

Fertiliser.	1917.	1918.	1920.	1921.	1922.	1923.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure	25 7	26 56	24 29	19 28	11 25	......
28 lb. Superphosphate ..	......	......	24 59	18 28	15 28	......
42 lb. ,, ...	......	27 28	... ..	......	......	19 54
56 lb. ,, ..	31 26	27 29	26 20	18 41	18 48	21 56
70 lb. ,, ...	34 3	27 53	......	......	20 8	......
84 lb. ,, ...	33 15	......	25 40	16 4	......	22 8

The year 1919 is again omitted, the crops having been a failure. The quantities of fertiliser used varied slightly from year to year, but the results are grouped as above for convenient comparison.

Oats for Horses—Silage for Sheep.

Upon one other feature of this farm we may dwell with interest. The owners are firm believers in oats, and grow from 80 to 100 acres of Algerian every year—not as rotation with wheat, for that to them would mean the fouling of their paddocks, but on a portion of the farm devoted to the purpose. The grain crop is harvested, well crushed and then fed to the farm horses. No wheat is fed to the horses, but wheaten hay is cut very green, chaffed, and fed with the crushed oats. Oaten chaff is refused altogether, as it is apt to infest the land with oats, but the grain is valued highly, and certainly the appearance of the teams testifies that the treatment they receive suits them in every detail.

But the oat crop has also another use. The stubble and after-growth are grazed with sheep until June or July, when the animals are removed and Algerian oats, black oats, and everything else are allowed to run up until September. Then the whole crop is cut and drawn at once to the silage pits, of which there are two, each with a capacity of 150 tons. Ensiled thus in a very sappy condition (and not at all damaged if there should be a shower of rain at the time) the oats (black and otherwise) make excellent silage. How valuable such a reserve is with sheep on the farm can be imagined. In the long dry spell of a few months back, the surplus feed accumulated in the silage pits kept the sheep alive, and just lasted until the rain came. Two months later these sheep were sold at up to 35s. per head, and Wyalong opinion about fodder conserved in such an inexpensive way doubtless improved accordingly.

Even after the silage material has been cut as described, sheep are turned on to the paddock again and are allowed to eat the stubble right out, after which—in December—the plant and animal residuals are turned under and the paddock is sown with Algerian oats again in April.

In this way the oat paddocks only carry a crop of grain once in two years, and are kept in good heart. In a dry season, of course, the spring growth is insufficient to make silage, but in a wet season enough is usually conserved to cover requirements amply. At the present time the pits are empty—the result of the dry spring of 1923—but they have "done their bit," and appearances suggest that they will be full again next spring.

Some other Fallows.

Though the time spent at West Wyalong was short, it afforded opportunity, with Mr. Gagie's generous guidance, for an inspection of a few other fallows. One has already been mentioned, and others afforded confirmation of the value of a properly consolidated seed-bed. A conversation with Mr. W. T. Wilson, of "Ballara," was valuable. Mr. Wilson is a Victorian, who for several years has resided in the southern Riverina, and who lately has acquired land near West Wyalong.

Working under conditions somewhat new to him, he is alive to the value of local methods and experience, and has been watching the "Spy Hill" paddocks with interest. The best of his paddocks was mouldboard-ploughed in July, and then—because surface cultivation conserves moisture, and there were several showers that were worth keeping—the land was harrowed in September, cross-harrowed in December, twice harrowed in January, scarified almost at once 2 inches deep, and again scarified at the end of February, drag-harrows following the scarifier each time. The result was a fallow of fairly good condition, the scarifying having promoted consolidation by breaking up the clods below the surface to some extent. The germination should be quite satisfactory, and the prospects favour a profitable crop.

On a second paddock not far away, the first ploughing had been with the disc-plough and the subsequent scarifying had been less timely, the result being that, notwithstanding several harrowings to conserve showers of rain, the soil was dry almost to the plough sole, and clods—unbroken as they fell from the disc-plough—held the soil open, permitting loss of moisture and delaying decay of vegetable matter. Under such conditions, the seed must await rain before it can germinate, and even then the crop stands great risk of suffering more by dry spring winds than it would if the land had been better prepared.

If the methods of farmers like Messrs. D. and J. Gagie mean profits for themselves, it is no small thing that they may also prove to the advantage of their neighbours and of their fellow farmers elsewhere. With the hope that this may be the case, we express very cordial thanks to them for the assistance and information they so unreservedly afforded for the purpose of this article.

Farmers' Experiment Plots.

Maize Experiments 1923-24.

Western District.

H. BARTLETT, Senior Agricultural Instructor.

Mr. E. J. Allen, of Gregra, during the past season conducted a maize variety trial and a maize manurial trial under the supervision of the Department.

The previous crop grown on the land was wheaten hay in 1922. The area was disc-ploughed in March, 1923, harrowed in April, mouldboard-ploughed in August, harrowed and springtooth-cultivated in September, and harrowed just prior to sowing. Shallow furrows were struck out 6 feet apart, and, on 4th October, 1923, the seed was sown in the furrows with a maize planter, three grains being dropped every 31 inches. Superphosphate was applied at the rate of 56 lb. per acre to the variety trial.

The soil was in ideal condition at sowing time, and germination was excellent. Growth was good and the cobbing promised to be exceptional, but very dry conditions occurred during December and January, just at tasselling time, and were fatal to fertilisation. Very few cobs filled, the majority maturing only a few grains, and many none at all.

The yields in the variety trial were so low that they afforded no indication of the yielding capacity of the different varieties, as the figures indicate:—Wellingrove 3 bus. 5 lb., Funk's Yellow Dent 5 bus., Early Morn 3 bus. 19 lb., Iowa Silvermine 4 bus. 13 lb., Golden Glow 8 bus., King of the Earlies 5 bus., Brazilian Fleur 1 bus. 32 lb., Bathurst crossbred 5 bus., Yanco crossbred 12 bus., Funk's 90-day 10 bus. 44 lb.

Although the yields were light, the heavier applications of superphosphate gave a markedly increased yield, largely due to the fact that the plants were in a forward condition at the advent of the dry weather. The variety used for this trial was Early Morn.

	bus.	lb.
112 lb. Superphosphate	9	0
75 lb. "	7	0
35 lb. "	3	28
No manure	3	28

The rainfall during the growing period was:—October, 92 points; November, 203; December, nil; January, 63 points; February, 681 points; Total, 1,039 points.

What Agriculture Requires.

What agriculture requires is a stimulus to fight its own battle. I was talking to an eminent agriculturist only the other day and a remark he made to me was this: "If we could get all our agriculturists to farm as efficiently as the 20 or 25 per cent. at the top there would be very few agricultural problems in this country."—Ramsay MacDonald, in a recent statement in the House of Commons.

The Origin of Bena Wheat.

J. T PRIDHAM, Plant Breeder.

THE history of Bena wheat dates back to 1917, when in a plot of Hard Federation, the produce of a single plant, an individual was noted as being comparatively free from rust and possessing a strong straw. The grain from this plant was sown in 1918. Its progeny was found to be unfixed, but it looked productive and had foliage of a healthy and rust-resistant character, and six plants were saved. In 1919 the best of these plants yielded remarkably well, and every plant in the plot was cut separately for pedigree culture in 1920. In that year the different strains showed variation, some having white chaff and others brown of various shades and varying degrees of tip-awn. Two or three strains appeared to be fixed, and one of these, sown in 1921, appeared to be constant. In this year also it yielded well, and in the past two seasons its producing power has been maintained, and it has every appearance of being fixed. From the character of the white-eared strains in 1920 it was concluded that the variety was a natural cross between Hard Federation and Marshall's No. 3. Plants of this nature are found from time to time in the breeding plots and when promising are made use of.

Bena has medium-spreading and abundant young growth, with dark glaucous green leaves. The straw is of good quality, not purple, and of medium height. The ear is rather erect, with a tip awn, brown in colour, large, bold, and does not shatter. The grain is large, white, medium translucent, producing flour of the medium-strong class. Bena threshes readily, is not so rust-liable as Hard Federation, matures a few days later, and may be called a general-purpose wheat, though the moderate length of straw and high percentage of grain to straw rather constitute it a grain wheat.

The yields of 54 bushels and 65 bushels per acre respectively in two field variety tests last season at Cowra were published, and in consequence we had many applications for seed. These we could not grant, but next year we hope to have some seed for sale, as the manager of Cowra Experiment Farm is sowing 10 acres.

DIVERSIFICATION INCREASES PROFITS.

IN many sections of our country the farming is not properly adjusted or diversified. This season there is distress in the wheat sections. It cannot be expected that a profitable and permanent system of agriculture can be attained until there is a proper balance in crop and livestock production. This is needed to help maintain fertility and to furnish profitable employment throughout the year. By selecting a proper combination of crop and livestock enterprises, and by using improved methods in the handling of the same, it is possible to lower the costs of production materially and increase farm profits.—BURTON M. SMITH, in *The Banker-Farmer*.

Bena Wheat.
A Promising Selection from Hard Federation.

"Chemistry of the Farm, Dairy, and Household."

Under the full title, "Elementary Lessons on the Chemistry of the Farm, Dairy, and Household," Mr. J. C. Brünnich, F.I.C., Chemist to the Department of Agriculture and Stock in Queensland, has placed before students of agriculture in Australia a decidedly useful work. It has grown up from a series of articles which appeared in the *Queensland Agricultural Journal,* and which, collected into a small book, have already gone through one edition. That preliminary experience no doubt afforded opportunities for a certain amount of retouching, but in the main the book remains the same, and as a text-book for students, and a means of reference when study gives way to the practice of agriculture, it should find an esteemed place in every farm library.

A general outline is given first of chemistry and chemical reactions, and then the production of soils, the growth of plants and of crops, the building up of animal bodies, and applications of the whole to feeding, to the handling of milk products, and to the control of the farmer's enemies (insects, plant diseases, and weeds) are each dealt with. The book is comprehensive, but it reduces technicalities to a minimum. Printed by the Government Printer, Brisbane. Our copy from the author.

Coming and Going.

After an interval of nearly fifteen years the *Journal of the Department of Agriculture* in Western Australia has resumed publication, and the first issue of the "second series" is before us.

Since the discontinuance in 1909 much valuable information collected by the Department has been made available to farmers by means of bulletins, but, while these have proved very useful, they were too specialised, says the Minister, the Hon. H. K. Maley, in his foreword, "and not of a sufficiently general character to serve the same effective purpose as the regular issue of a 'Journal' with its diversified information." Increasing settlement creating a demand for technical agricultural information, and a desire to promote a Western Australian sentiment among farmers, have also been factors in the determination to re-establish the *Journal,* which for the present will be a quarterly. A great variety of matter has been collected for its initial appearance, and the issue should sharpen the appetites of its readers for more.

While it is our pleasure thus to announce one journal, it is our duty to bow out another. The Canadian *Agricultural Gazette,* according to its own cover, was not intended for general distribution, its aim being merely to indicate the policies and activities of the Dominion and the Provincial Departments of Agriculture. With the excellent and very practical *Seasonable Hints,* published monthly by the Department for different parts of the Dominion, the disappearance of the *Gazette* is not very significant to the Canadian farmer.

The time to commence the proper production of a draft horse is before he is born. Not only in the selection of his sire and dam but in the care and management of the dam while pregnant. Strong healthy foals can best be produced from healthy mares which are fed nutritious food and given plenty of exercise, running in fields or paddocks or doing light work.
W. H. Hicks, in *Seasonable Hints,* Canadian Department of Agriculture.

Fodder Conservation and Finance.

THE FACILITIES OFFERED BY THE RURAL BANK.

J. KING, Government Savings Bank of New South Wales.*

THE question of conservation of fodder is one that has had the most earnest and sympathetic consideration of the Commissioners of the Government Savings Bank. They have realised that the more generally the principle is adopted by the clients of the bank, not only the more able will those clients be to meet their obligations to the bank, but the more able will they be to withstand the effects of the droughts which so frequently occur (and which in many districts are regarded as a more or less normal condition), so tending to a more prosperous and contented rural population.

The Commissioners have realised that the necessity for conservation of fodder arises from two facts, viz. :—

(*a*) The destruction of natural herbage by the ravages of the rabbit.

(*b*) The failure of the natural herbage to exist on account of drought conditions.

There are some people who maintain that if the rabbit pest were eradicated there would hardly be any necessity for the conservation of fodder other than in its natural state, and they therefore urge that efforts be concentrated on the extermination of the rabbit. There are others who, while realising the necessity for attacking the rabbit at all times, advocate that the greater concentration should be given to the conservation of fodder in what might be termed artificial forms, such as hay, grain, or silage. The Commissioners feel, however, that the ideal result is to be obtained by adopting both methods, and they have decided to give financial assistance to all their clients who will take advantage of the concessions.

Wire Netting.

They are prepared to make advances sufficient to cover the whole cost of wire netting supplied by the Pastures Protection Boards, notwithstanding the fact that the client may have previously obtained the maximum advance that could otherwise have been made against the security held. It will be necessary before any such advance is made for the Commissioners to be supplied with a certificate from the Pastures Protection Board that the netting has been erected in accordance with the requirements of the Pastures Protection Act, and they will also require to be satisfied that netting so supplied is only to be used for the purpose of netting productive land, and not land that is green or useless for pastoral or agricultural purposes.

* Address delivered before the Fourth Annual Conference of Western District branches of the Agricultural Bureau, held at Parkes, April, 1924.

The procedure to be adopted would be as follows :—

The client would apply to the Pastures Protection Board for the required quantity of netting and at the same time lodge an application with the Pastures Protection Board for an advance from the Government Savings Bank to cover the cost of same. The Board would first deal with the application for netting, and if granted would endorse the loan application that it was prepared to supply the netting and that the amount of loan applied for coincided with the cost of the netting. The loan application would then be forwarded to the Commissioners by the Board, and on the loan being approved the Commissioners would notify the Board that they were prepared to make the advance. The Board would then arrange for the supply of the netting, and when it was erected would issue a certificate to the Commissioners that it had been erected in accordance with the provisions of the Pastures Protection Act. The Commissioners would then pay the money to the Board, after taking a further charge over the holding, and would look to the settler for repayment on the terms and conditions set down at the time of granting the loan. If, however, the maximum loan had not already been advanced by the Commissioners on the holding, a loan up to the maximum loanable sum would be made direct to the client without reference to the Pastures Protection Board.

It might be thought at first glance that this arrangement is no better than that already in existence, whereby the settler obtains the netting from the Pastures Protection Board and makes the instalment payments direct to the Board. Some explanation of how the arrangement came to be made will show the advantages of the scheme.

Some Pastures Protection Boards refused to grant netting to those settlers who were borrowers from the Government Savings Bank because their legal advisers informed them that they could not obtain a first charge on the land of the settler, seeing that the Government Savings Bank was a Crown institution. Section 30 (Proviso A, subsection 4) of the Pastures Protection Act reads as follows :—" Such purchase money and interest shall be a charge on the holding of the owner within the district; such charge shall have priority over all mortgages or other charges thereon . . . . other than debts due to the Crown." Those Boards then refused to lend to clients of the bank, seeing that the Commissioners' charge ranked prior to the Board's statutory charge.

The matter was then brought under the notice of the Minister for Lands, who immediately approached the Commissioners, and the result was that this scheme was approved and submitted to all Pastures Protection Boards in the State, and although all Boards have not yet approved of the scheme, it is hardly likely that any of them, when they really realise their position, will hesitate to adopt it.

Conservation of Fodder.

The question of the artificial conservation of fodder is one that is far more difficult to solve. Many propositions have been put forward by enthusiasts from time to time, but the fact that they have not yet been put into effect tends to prove that they are more or less impracticable. In almost every instance the larger schemes put forward involve a large monetary contribution by the Government and a consequent controlling voice; and judging from past experience the primary producer should be chary of any scheme that is not absolutely under his own control. These schemes also would necessitate supervision, valuation, overhead charges, &c., in the marshalling of the stocks at suitable centres and the subsequent distribution of them when required by the stockowner. When these charges are added to the losses that would inevitably occur from natural causes and faults in administration, it is very doubtful whether the stockowner would be in any better position than he is in today.

Other schemes provide for the conserved fodder to be retained on the farm by the grower until such time as it might be required by the stockowners, but suggest that in the meantime the Government or some other institution should make advances to the individual grower to cover the cost of production and conservation. Here again the cost of inspection, valuations and supervision militate against the practicability of the scheme. Possibly the scheme put forward by Mr. Tayler* is the one that comes nearer the solution of the problem than any other. His scheme provides for conservation on the grower's farm, under the control and supervision of a credit society formed by the growers concerned. The weak point in his scheme is that he wants some institution to make advances to the individual grower on the security of the very limited liability of the individual grower, his more or less destructible conserved fodder, plus some other slight responsibility.

If Mr. Tayler were to amend his scheme to provide for the credit society to borrow the whole of the money required collectively by his group of growers, offer the joint and several guarantee of the members, undertake the responsibility of making the advances to the individual grower, and also the valuation and supervision of the fodder security, he would have a very fair prospect of obtaining for the grower the accommodation required. The risk undertaken by the guarantors would be well covered by the provisions of the recent co-operative societies' legislation, wherein the society is given a statutory lien over the fodder and provides that additional security can be taken in the form of promissory notes or otherwise. The success or otherwise of such a scheme would depend practically on the manner in which the supervision by the society itself was carried out, and it is reason-

* See "A National Scheme for the Conservation of Fodder," by W. E. Tayler, in this *Gazette*, May, 1922.

able to assume that the joint and several liability of the members would ensure a maximum of vigilance.

The Commissioners have carefully considered all the schemes that have been suggested for the conservation of fodder in an artificial form, and in deciding upon the assistance that they are prepared to offer took into account whether it would be preferable to encourage—

1. The conservation of fodder on the farm for the use of the grower only.
2. The conservation of fodder on the farm by the grower so that he might hold it until such time as it might be required by other stockowners.

The latter idea presented so many difficulties and objections that for the present they have decided to encourage the former, particularly as it was considered that the most economical and useful manner to conserve fodder is in the form of silage. With this object in view, they are prepared to make advances to their clients whose secureties they hold on the following basis.—

For Pit Silos.—Up to 1s. per cubic yard of excavation.

For Concrete and Wooden Tub Silos.—(1) Up to the full value of the silo where the cost of construction is available on the security held: and (2) up to 80 per cent. of the cost of the silo on completion where a borrower has already obtained accommodation up to the maximum loan available.

The term of repayment will be decided when the application is being considered, but in any event the Commissioners will require a regular reduction of principal. In all cases where loans have been made by the bank for the construction of silos, it will be necessary for the borrowers to keep the silos filled with silage as far as practicable. Where silage is stored in tub silos, it will be necessary for borrowers to take out insurance against damage by fire, &c.

With the object of encouraging their clients and others to conserve fodder, the Commissioners have issued a pamphlet setting out the terms and conditions on which loans will be made for this purpose, and giving directions carefully compiled by the Department of Agriculture for making silage and constructing the silos. The Commissioners are prepared, however, to consider sympathetically propositions for the financing of co-operative credit societies to be formed for the purpose of conserving fodder on the growers' farms for ultimate sale. Until some concrete proposition is put forward indicating the lines on which such societies propose to operate and the financial assistance required, it is not possible definitely to state to what extent or on what basis the bank may assist such projects. While anxious to help in the legitimate conservation of fodder, the Commissioners have to be careful not to give help that would have the effect of enabling producers to hold back produce for famine prices.

Clarence River Maize-growing Contest.

W. R. WATKINS, Agricultural Instructor.

A MAIZE-GROWING contest for early varieties, inaugurated by the Clarence Pastoral and Agricultural Society, was carried out during the season 1923-24, on Mr. W. T. Boyd's farm at Carr's Creek. The object of these contests is to determine the highest-yielding varieties or strains of early maize in the district. They also afford to a farmer an idea of how his variety or strain compares with others that are being grown in the district.

That a keen interest was taken in the contest may be seen from the number of entries, which totalled eighteen, including a non-competitive entry of Leaming from Grafton Experiment Farm. It was a great pity that dry and adverse conditions should have prevailed practically right through the growing period, spoiling to a large extent what promised to be an excellent contest. Very little rain had fallen during the winter, and the plots had practically no rain from time of planting (early in September) until late December, when it was too late to be of any benefit. When these conditions are taken into consideration it will be seen that the plots did exceedingly well in producing yields of even 30 bushels per acre.

The farmers who competed were :—

G. H. Parnell, Carr's Peninsula.
J. McFarlane, Ulmarra.
Ivan Ford, Grafton.
T. J. Ford, Grafton.
W. T. Boyd, Carr's Creek.
S. Paine, Grafton.
Berry Brothers, Southgate.
D. E. Weeks, Carr's Creek.
H. J. Dix, Carr's Creek (two entries).
A. E. Turner, Carr's Creek.
W. J. Morris, Carr's Peninsula.
W. Gear, Great Marlowe.
F. E. Paine, Great Marlowe.
S. See, Carr's Peninsula.
T. Boorman, Carr's Peninsula.
F. R. Crispin, Carr's Creek.

The seed, with the exception of two samples, was mostly of good type and colour; of the eighteen samples entered twelve were Leaming. four Broad Leaming (Golden Beauty type), and one Georgie Gregor (Small Yellow Horsetooth)

The land on which the contest was conducted was a uniform piece of rich alluvial loam, typical of the best Clarence River maize land. It was well prepared and was harrowed just prior to planting, which was carried out on 5th September. The seed was dropped by hand to secure an even planting at the rate of three grains every 30 inches in drills 4 feet apart, and covered with the scuffler.

The season, as already remarked, proved to be one of the driest experienced for a number of years, and consequently only poor yields were obtained. The hot dry winds that prevailed during September and part of October, and the absence of rain until late December practically spelled failure for the contest, the results proving better, however, than were first anticipated.

Pulling and husking was carried out on 4th March, and threshing on 13th March, by Messrs. H. J. Dix and W. T. Boyd of the Society and representatives of the Department.

RESULTS of the Contest.

Competitor.	Variety.	Yield per acre.	
		bus.	lb.
W. T. Boyd	Broad Leaming	38	2
S. Paine	Georgie Gregor	35	25
Berry Brothers	Leaming	33	53
G. H. Parnell	,,	33	13
D. E. Weeks	,,	32	7
Department of Agriculture	,,	32	7
J. McFarlane	,,	31	42
Ivan Ford	,,	31	42
H. J. Dix	Broad Leaming	31	42
H. J. Dix	Leaming	31	21
A. E. Turner	,,	31	1
W. J. Morris	,,	31	1
W. Gear	Broad Leaming	29	9
T. J. Ford	Leaming	28	24
F. E. Paine	Broad Leaming	28	3
S. See	Leaming	28	3
T. Boorman	,,	27	28
F R. Crispin	,,	22	29

Mr. W. T. Boyd gained first place with a sample of Broad Leaming (Golden Beauty). It was a fairly broad grain, with a slight admixture of ordinary Leaming, and showed no uniformity of colour. It proved to be a rather late maturer for an early variety, but made up in the yield.

Mr. S. Paine occupied second place with a sample entered under the name of Georgie Gregor, which is undoubtedly a strain from the Small Yellow Horsetooth variety. This was a fairly long thin yellow grain, with rough to pinched dent, but of good uniform colour, size, and shape. It was an exceptionally late-maturing strain for an early variety, but yielded well.

One of the best samples of grain entered was the Leaming of Messrs. Berry Brothers, who came third on the list. It was of a good, even, hard type with a smooth dent, thick and deep-grained, and with a good, even, dark-amber colour, all pointing to the fact that great care and judgment had been exercised in the selection of seed. It is an exceptionally good strain, combining earliness with yield.

It has been suggested that in future contests for early varieties points be allotted for type, earliness, and yield, and, in view of the fact that growers of early varieties go in for producing an early-maturing strain combined with good yielding qualities it seems only fair that type and earliness should be considered in determining the results. The scale of points advocated for future contests is as follows:—Type, 10 points; earliness, 20; yield, 70; total, 100 points.

Broom Millet Growing in New South Wales.

[Concluded from page 172.]

H. WENHOLZ, B.Sc. Agr., Special Agricultural Instructor.

Requirements of the Trade.

MOST of the largest broom factories are situated in Sydney, but there is also one at Newcastle, one at Hinton on the Hunter River, and one at Tinonee on the Manning River. Many different types of brooms are manufactured, according to the class of brush available to work with.

In the manufacture of brooms, three classes of brush are required—"inside" "cover" and "hurl." "Inside" millet is used for forming the inside of the broom, and for the best brooms is generally not more than 17 inches long. There is a type of dwarf broom millet, largely used for "insides" and for small brooms in America, which local manufacturers say they could do with here, but the yield is small and it has not yet been decided by experiments whether it will be profitable to grow this class of millet under any conditions in this country. In the meantime, "inside" millet is generally made up by the manufacturers from some of the poorly developed brush of the long White Italian variety.

"Cover" is the class used for covering the inside and also for forming the shoulders. For the best brooms it should be 17 to 20 inches long.

"Hurl" is the longest brush, ranging from 20 to 25 inches for good brooms. The best hurl is fine, even, straight fibre, and forms the outside of the broom to give it a nice finished appearance.

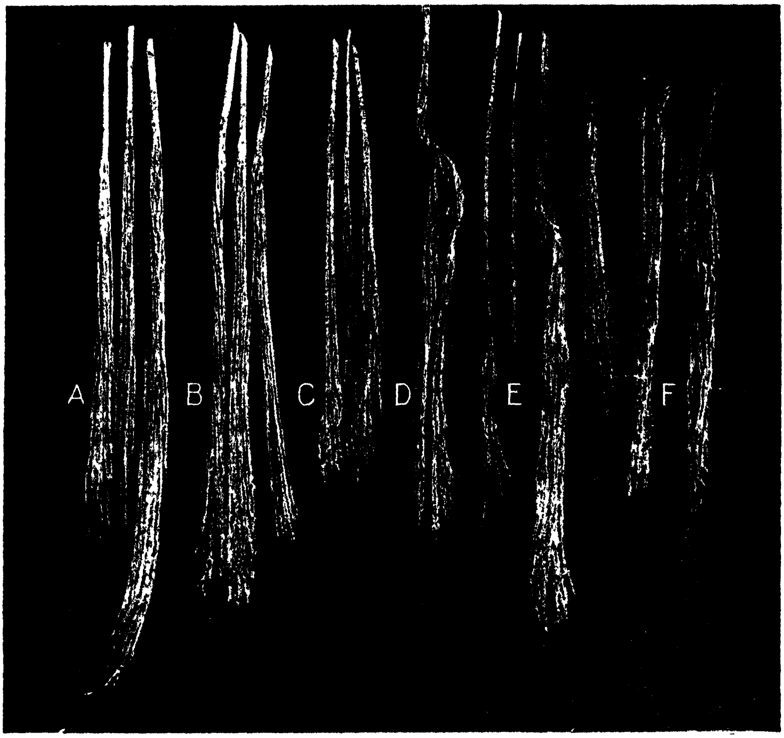
About 1½ lb. of brush are required to make an ordinary broom and the three grades are used in about equal proportions.

The manufacturer and the farmer need to be brought into closer touch, for many improvements could be effected by the farmer who knew the manufacturer's requirements. Some of the most important of these are :—

(1) Complete removal of the seed.
(2) Grading out inferior, broken or badly bent or very coarse brush.
(3) Uniform length of stem cut with the heads.
(4) Uniform and good colour.
(5) Regular sized bales, well packed and pressed.

It is also to be deplored that dishonest practices exist among farmers, such as facing the outsides of the bales, filling with inferior material and rubbish, watering bales to increase the weight, &c. Unfortunately, manufacturers have been compelled in some instances in the past to import millet

from Italy rather than risk the poor get-up of the local product, but a noticeable improvement has taken place in recent years, though the imported article is usually of very good quality and our growers should bestir themselves still further in the direction of improving their product for market. A fairly good market exists at times in New Zealand for locally-grown broom millet, but this can only be maintained by a uniform high standard, and good honest growers have at times to suffer by lower prices because of the negligent or dishonest farmer in the neighbourhood.



Samples of Millet Heads, from prime (A and B) to rubbish (D, E, F).

(*Photo by Mr. G. M Marks.*)

Selection of Seed.

As a general rule, selection of seed is a much neglected operation. Many farmers still rely on the "scoop shovel" method of obtaining their seed from the heap after hackling. This method cannot be too strongly condemned. Its use leads to great deterioration both in the yield and quality, poor yield and inferior brush being common in crops sown with seed procured in such manner.

The best growers select their seed in the field from the best heads. The number of heads required to sow a few acres is comparatively small and the

selection of seed in this way is justified by the improvement effected in the yield and the quality of the brush. The most important points to look for in selecting seed heads are :—

(1) Fine, long, straight, round, abundant, uniform fibre with absence of thickened central stem.
(2) Seed compactly situated mostly at the end of the brush (to facilitate hackling), the brush arising compactly in a close whorl from the stem and well exserted from the leaf sheath.
(3) Freedom from disease such as red stain (on the brush and in the stem) and smut.
(4) Good plump well-developed seed of light colour.

It is a good plan to have a special seed plot of broom millet where a few of the very best heads can be sown and in which improvement can be more quickly effected, as owing to the cross-fertilisation which occurs, plants with good brush may be cross-fertilised by plants bearing poor brush in the vicinity, and with a smaller seed plot the selection may be made more rigorously with less chance of including the poorer types. Then sufficient seed can be selected each year to sow both the seed plot and the field area, keeping a few of the very best heads for the seed plot.

In the seed plot the heads can be left until they are properly matured before harvesting, though they may require protection in the field from birds, which can be given by covering them with a light muslin bag. After harvesting, the heads are thoroughly dried, hackled and the seed cleaned and put away. Fumigation with carbon bisulphide and storage with naphthaline is recommended to secure the seed against weevils and grain moth.

Farmers are urged to take some measures for selecting their own seed, as it cannot be expected that growers will go to any great amount of trouble in selecting seed for other farmers' use. Purchased seed is generally " scoop shovelled " from the bulk, and in view of this, every grower would be wise to do his own selection.

Early sowing is almost essential for a good setting of seed, as late sowings are usually very deficient in seed.

Pests and Diseases.

Broom millet is not greatly troubled with insect pests. Aphis is probably the worst to contend with, being apparently an agent in distributing the obscure red stain disease in addition to sapping the plant somewhat when present in abundance. No economically practicable method of dealing with them is known. The caterpillar of the yellow peach moth also bores a little into the stem at times, but it does not do a great deal of damage. In Italy and other European countries, the European corn-borer is prevalent in the broom millet crops, but apparently does far more damage to maize. It has in recent years been introduced to America through shipments of broom millet from Europe, and has been responsible for much damage to the maize crops in the north-eastern States and in Canada.

The chief diseases known in broom millet are red stain, smut, and leaf blight.

The red stain disease has made marked headway in the Hunter River district in recent years. It is observed more in a wet season, but has been found to be fairly abundant even in dry years, though it does not occasion so much loss in such years. The disease manifests itself in a premature whitening of the leaves of the plant and sometimes occurs in patches of the crop, but more often in scattered stalks throughout the field. Sometimes the brush is badly affected, and aphis can apparently carry the disease, for whenever they are observed—usually more so in a dry season—in the emerging head, the brush is almost always stained. This causes brittleness in the brush and lessens its value for manufacturing purposes.

Plants which show premature whitening of the leaves are, however, usually the most seriously affected. When the stem of such plants is cut across, it may not show any sign of the disease, but in every instance if the stem be cut low down and just below a node the disease will be readily seen. Such plants rarely produce good brush—often in fact they never produce a brush worth harvesting, and in a wet season a secondary rot sets in at the base of the stalk, causing the plants to fall over and occasioning their loss before harvesting takes place.

Sowing the crop on clean land which has not carried a crop of broom millet or sorghum the previous year at least is one important means of safeguarding the crop. It has been found in some cases that the crop has been almost a total failure on land which had carried a diseased crop the previous season. It has also been shown that the disease may be transmitted through the seed. Seed should therefore be obtained from a clean crop. No method of seed treatment is of any value, as the mycelium of the fungus lies within the seed.

There appears to be considerable ground for the hope of obtaining a red stain resistant strain of seed by continued selection in the field of disease-free plants, for there is observable in all fields much variation in the susceptibility of different plants. This work is being undertaken by the Department.

There are two kinds of sorghum smut, but the one which is usually seen in broom millet is the smut of the individual grains. Treatment of the seed with a 1½ per cent. solution of copper sulphate is recommended for seed showing any trace of this smut.

Leaf blight is a disease which makes its appearance in wet seasons, particularly in late-sown crops. Avoidance of late sowing usually overcomes the trouble, which would also be avoided largely by rotation.

Place in the Rotation.

From the point of view of disease alone, it is advisable that broom millet should not be sown on land which has grown either broom millet, sorghum, or sudan grass at least the previous year. Quite apart from this, the best results are not obtained when broom millet is sown after these crops, because in each case they leave the land in somewhat poor physical condition, and if followed by a dry winter, it is found exceedingly difficult to work the land

into a good seed-bed for the next crop. Broom millet does better after maize, but the best results are obtained when it follows lucerne or some green manuring or leguminous or root crop. On account of the poor physical condition resulting, especially in ground that has been under cultivation some time, it is advisable to grow a green manuring crop such as cowpeas, field peas or vetches on the land occasionally if it is to be cropped much to broom millet.

Use of Seed.

The value of the seed of broom millet has become more widely recognised during recent years, largely owing to the high prices which have been ruling for maize, wheat, and other grains. Beyond a little use being found for it on the farm, it was a neglected asset until about 1920, when with maize at 9s. 6d. and wheat at 8s. 6d. per bushel, broom millet seed found its way on to the market in Sydney as a feed grain and was sold for £10 per ton. At this time it was being utilised, ground into meal for poultry. On the farm it is chiefly used for poultry and pig feed (soaked in skim milk when fed to the latter) For farm horses many farmers have found it a good substitute for maize, being nutritious and palatable when ground, but there should be no hint of damage by heating or trouble will be experienced.

As the grain is harvested in the immature stage, it has still a high moisture content, and as insect pests (weevil and grain moth) are particularly active as a rule at the harvesting period, special care is necessary to keep the seed any length of time. To store broom millet seed successfully it should be first hackled clean, taking every advantage of "wind winnowing" to get rid of the dust and dirt during the process. Spreading out in thin layers on tarpaulins in the sun or kiln drying in a loft is then desirable to get rid of the excess moisture. Treatment with carbon bisulphide to get rid of weevils and moths may then be necessary before storage, during which thorough ventilation and free circulation of air through the grain is essential. Good ventilating devices are wire fly screens on the floor of the barn and distributed through the heap. Unless some such precautions are taken to dry the seed quickly, especially in coastal districts, it soon becomes reduced to a mouldy, worthless heap. The feeding value of good quality broom millet seed may be reckoned to be about three-quarters that of maize, so that some attempt to save the seed for feeding on the farm at least is justified.

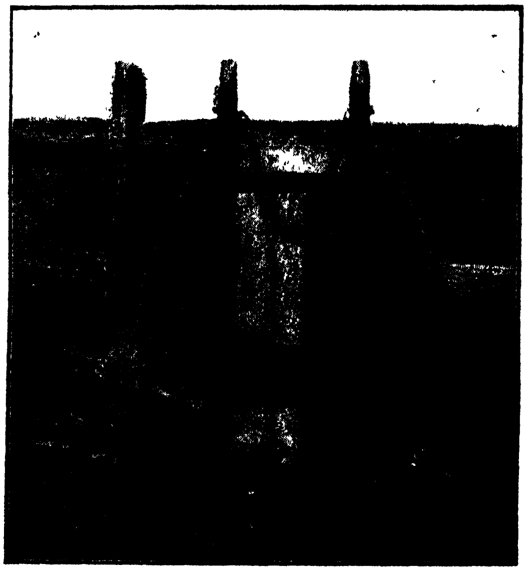
Stalks and Leaves.

During dry times many farmers make use of the standing stalks left after harvesting the heads for cattle feed, either by cutting and carting out to cows or by turning them in on the crop. While feed is scarce there is some value in the bulk supplied in this way, the leaves, of course, constituting the best part of the crop, the stalks, which contain very little sugar or sap, consisting mostly of pith and fibre. Some farmers contend that there is some milk-producing feed in millet stalks at any time, but very little use is made of them if other feed is available, and they can only be looked upon as a somewhat useful standby when feed is scarce.

The stalks are best got rid of by cutting with a sled cutter (see accompanying illustration) or a chopping roller, or rolled down and chopped up with a disc-harrow, and ploughed under to improve the mechanical condition of the soil.

Yield and Prospects.

A yield of 15 cwt. of marketable brush per acre is considered very good, and the seed may give up to 30 bushels per acre in addition. In some seasons it is possible to get a fair "ratoon" crop; that is, after cutting and removing the stalks, a second growth is allowed to take place. This may yield a few hundredweight of moderate to poor brush.



A Home-made Sled Cutter.

The blades are made from old saws, the backs of which are sharpened to give a cutting edge. The implement is used for cutting maize and millet stalks.

In recent years the price of good self-working bales of broom millet has been from £40 to £60 per ton, with lower prices for poorer quality. One advantage of this crop is that it may be stored successfully for years without deterioration and sold when prices are good, but many farmers cannot afford to hold their crops too long, both on account of lack of storage accommodation and for financial reasons.

The demand for broom millet on the Sydney market is limited, and with the Italian product still coming in—despite as already mentioned, a duty of £8 per ton—over-production would be easy. There is, however, as with all crops, a profitable undertaking in broom-millet growing for the grower who puts up a prime bale of the best quality for market.

Weeds of New South Wales

W. F. BLAKELY, Botanical Assistant, National Herbarium, Botanic Gardens.

Russian Knapweed (*Centaurea picris* Pall.).

Compositæ: Daisy Family.

Botanical Name.—*Centaurea*—centaury, the classical name of a plant fabled by Ovid to have cured a wound in the foot of Chiron caused by the arrow of Hercules, Chiron being one of the centaurs, or war-horse breakers, of Thessaly; *picris,* referring to the bitter juice of the plant.

Common Names.—Russian Knapweed is the name generally applied to the plant in America; in Victoria it is known as Hard Heads.

Popular Description.—Russian Knapweed is a somewhat robust, deep-rooted small shrubby plant 1 to 3 feet high, with numerous, slender leafy branches. The leaves are narrow, soft and slightly hairy, of a dull greyish-green colour, and from ½ to over 1 inch long. The flowers are produced on the tips of the branches; they are about ½ inch in diameter, pale pink or lilac, and somewhat thistle-like, and before expansion the buds are round and hard. The seeds are small, oblong in shape, smooth, and whitish in colour, and very much larger than lucerne seed.

This plant is not unlike the cockspur in general appearance, but the flower-heads are not spiny like those of cockspur.

Botanical Description.—A deep-rooted, slightly woolly, perennial herb, 1 to 3 feet high, with slender, virgate, leafy branches: leaves narrow, lanceolate to spathulate, a few coarsely-toothed, sessile to very shortly petiolate, ½ to 1 inch long. Involucres ovoid to globular, on terminal peduncles; bracts closely imbricate, whitish, smooth and shining, with hyaline margins, the outer ones 5- to 7-nerved at the base, the membranous margin rather prominent and slightly reflexed; inner bracts narrow, the apex plumose. Florets pink or purple, all equal; achnes smooth; pappus barbellate.

Country of Origin.—It is a native of the Caspian Sea region of Southern Russia, where it is a pest in lucerne fields. In several parts of the United States of America it has spread rapidly, mainly in lucerne paddocks and adjacent land. Its seeds are said to have been introduced into that country in consignments of Turkestan lucerne seed.

Appearance in Australia.—Russian Knapweed was first observed in Victoria in 1907, and in New South Wales in 1920; specimens were received at the National Herbarium from Mr. F. H. Shultz, Henty, who stated that it was introduced in lucerne seed two years previously. It has also been collected at Warmatta, Berrigan district, Tamworth, and Inverell, and a specimen has recently come to hand from Mr. R. Thomson, Experimentalist, Yanco Experiment Farm, who writes:—"I am enclosing a sample of a weed which has appeared in a crop of maize this season, and would be pleased if you would let me know its name. From information available it appears to be species of Centaurea. The weed is in circular patches about 10 to 15 yards in diameter, and while it by no means smothers the ground, its effect

Russian Knapweed (*Centaurea picris* Pall.)

on the maize crop is most marked, the maize in those places being only a few inches high. In the young stages the plant is a rosette, and it has a strong tap-root."

The Yanco plant is slightly different to the other specimens, and it appears to be referable to the variety *virens*.

Nature of the Weed.—From all accounts the plant is very hardy, and it possesses a strong penetrating root which enables it to withstand rough usage as well as droughty conditions, a factor which makes it all the more difficult to eradicate. One correspondent stated that the more he tried to get rid of it the more it grew. Being a member of the thistle family, it is amply supplied with pappus-bearing seeds, which, when ripe, are liable to be disseminated over large areas by the first gust of wind. These seeds soon germinate and develop into sturdy plants during the late winter and spring, and in favourable districts they produce flowers and seeds throughout the summer.

It does not appear to possess any injurious properties, and like other allied species it is rejected by stock, either on account of the bitter properties it contains, or because more palatable feed is available.

Clean Seed Essential.—Farmers purchasing imported lucerne or clover seed should keep a sharp watch for this weed, and if any foreign seeds are detected, it is better to destroy them than to run the risk of propagating plants which may eventually turn out to be obnoxious.

It is a great mistake to sow seed of any description without first ascertaining whether it is free from impurities. If clean seed had been sown in the past there would be fewer weeds to contend with to-day and more money available for other work. Practical farmers realise that a little time and labour spent in cleaning seed means money saved.

Means of Control.—So far, Russian Knapweed appears to be confined mainly to lucerne fields in this State, and it is highly important that it be not permitted to set its seeds. This can be prevented, either by cutting before the flower buds appear, or wholly uprooting the plants with a suitable implement. If the patches are small, the labour of hand-pulling it from the lucerne will be well worth while. Where it has become well established, it will be found necessary to put the land to rotation crops for at least two or three years. If this is not practicable, early and late fallowing will be most effective.

To Destroy Weeds on Paths.

To destroy grass or weeds on gravel paths or on chip tennis courts an arsenic mixture (1 lb. of white arsenic with ½ lb. of caustic soda dissolved in 4 gallons of water) is frequently used, being both cheap and effective. A fairly concentrated solution of common salt applied hot is also effective, and so, too, is spraying with crude residual oil, such as is obtainable from gas companies. Both of these treatments would be rather more expensive, however, than that first mentioned.—A. A. Ramsay, Chemist.

Insect Pests of Cotton in New South Wales.

[Continued from page 138.]

W. B. GURNEY, F.E.S., Government Entomologist.

The Green Striped Cotton Moth (*Earias huegeli,* Rogenh.).

THIS is a creamy white moth with a green stripe on the fore-wings. It has a wide range in Australia, being recorded from New South Wales, Queensland, the Northern Territory, Victoria, and South and Western Australia, and it attacks both cultivated cotton and wild cotton bush. In New South Wales it is widespread, being found equally in coastal and inland areas, and it is recorded at such widely separated districts as the coast from the Illawarra to the Tweed River, and inland in the Riverina, Hunter River Valley, Moree, Broken Hill, &c. Outside Australia it has been recorded from Fiji, Tahiti, and the Gilbert and Marquesas Islands.

The food-plants are cultivated cotton (*Gossypium*) and wild cotton bush *Hibiscus* spp.).

Besides *E. huegeli*, we have five other species of this genus recorded from Australia, viz., *E. smaragdina, E. parallela, E. subviridis, E. ochrophylla,* and *E. luteolaria,* but these species are not yet noted attacking cotton.

Life History.—The rounded eggs are laid singly on the plant, generally towards the terminals where the flowers, squares, and bolls appear. The larvæ attack the terminals and flowers during the earlier part of the season and later in the season attack the squares and bolls.

A brief description of the caterpillar and cocoon will enable the farmer to distinguish this pest from other bollworms. The caterpillar is of a general dark brown colour, mottled by darker brown patches on the lighter brown ground colour. Small fleshy tubercles are present on the back, and a transverse row of four of these tubercles to almost all the body segments gives the surface a minutely spinous appearance. Each tubercle is surmounted by a long black hair. Older larvæ show larger light brown or buff-coloured patches on the back, and have also small patches of orange colour on the back, while many tubercles are yellowish or orange-coloured, and thus the older grubs are much lighter in colour. After feeding for several weeks the caterpillar is full grown, and is then about three-quarters of an inch in length and comparatively broad, the head and tail ends being much narrower than the rest of the body. The fully fed caterpillar now crawls out of the flower or " boll," and may spin its cocoon attached to the plant or boll, or in the soil or debris at the base of the plant. The cocoon is readily identified when found, being small, tough, smooth, silken and oblong or

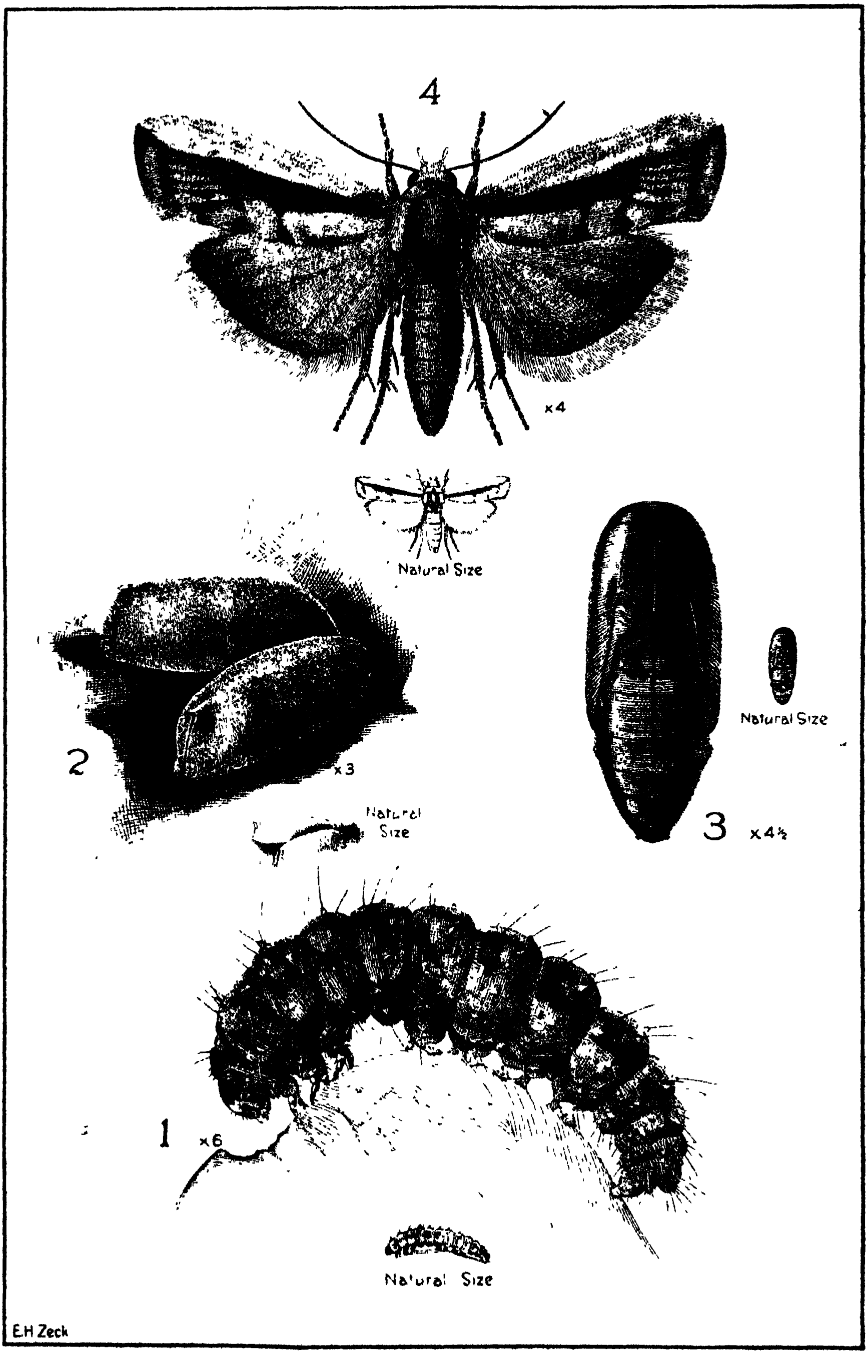


Fig. 18.—The Green Striped Cotton Moth (*Earias huegeli*).
1.—Caterpillar. 2.—Cocoons. 3.—Pupa. 4—Moth.

boat-shaped in outline, and of a dirty white or pale brown or even buff colour. It varies from one-third up to half an inch in length, and is firmly attached to the surface upon which it is spun

Caterpillars in various stages of growth were obtained in the cotton plots at Grafton and the Richmond River as late as the middle of May this season.

The moth is creamy white to buff colour, usually with a definite long green stripe on each front wing. Wing expanse ¾ to 1 inch; length of body ⅜ to ½ inch.

Damage.—The pest being widespread it causes a persistent, though not necessarily heavy, loss by damaging or destroying the flowers, squares, and bolls. It destroys some of the lint and seeds, and the entrance and exit holes in the bolls permit of further decay owing to the entrance of moisture and encouragement of fungus diseases. Though causing a percentage of loss in most districts, yet in the North Coast cotton areas it is not so serious or prevalent in cotton as the Yellow Maize or Cotton moth (*Dichocrocis punctiferalis*), nor is it feared as much as the Monolepta beetle (*Monolepta* (*rosea*) *australis*).

Control.—The irregular appearance of the broods of caterpillars, and the fact that for much of its time the caterpillar feeds hidden within the flowers or bolls, renders it difficult for external sprays or dusts to be effective. However, it does feed sometimes on exposed parts, and can then best be destroyed by dusting with calcium arsenate powder. The pest is also usually thinly scattered in the crop, and it is not always practicable, nor, indeed, profitable (unless the infestation is very severe) to dust the whole of large patches of cotton without a power dusting-machine. If dusting is deemed advisable, whether by power dusting-machines or by shaking from cloth bags held in the hand or at each end of a short pole, the dust recommended is calcium arsenate, which may be diluted at the rate of 1 part to 5 to 10 parts of dry slaked lime dust.

The possibility of the aeroplane proving a cheap, rapid, and practicable medium for the dusting of field crops in a defined area with arsenic has been attracting attention in England and America. Preliminary tests have been conducted over field crops, including cotton, and also over forest areas, and have given promising results, on the score of both cheapness and rapidity of application.

The Cotton Tip Moth (*Eucosma plebeiana*, Zeller).

A New Pest of Cotton.—This species the writer discovered attacking cotton at Sydney and at Grafton, and also attacking flowers of hibiscus. Dr. E. Jefferis Turner of Brisbane has kindly identified the moth for me as *Eucosma plebeiana* which belongs to the Family *Olethreutidæ*, and he states he has recorded the caterpillar as feeding on debris in dead flowers of hibiscus, &c. Zeller has recorded it feeding on alphea and lavatera (*Malvaceæ*). The adult moth is recorded in New South Wales from Sydney, Newcastle, Bathurst, Grafton, and from heights of 3,000 feet at Cooma and Glen Innes.

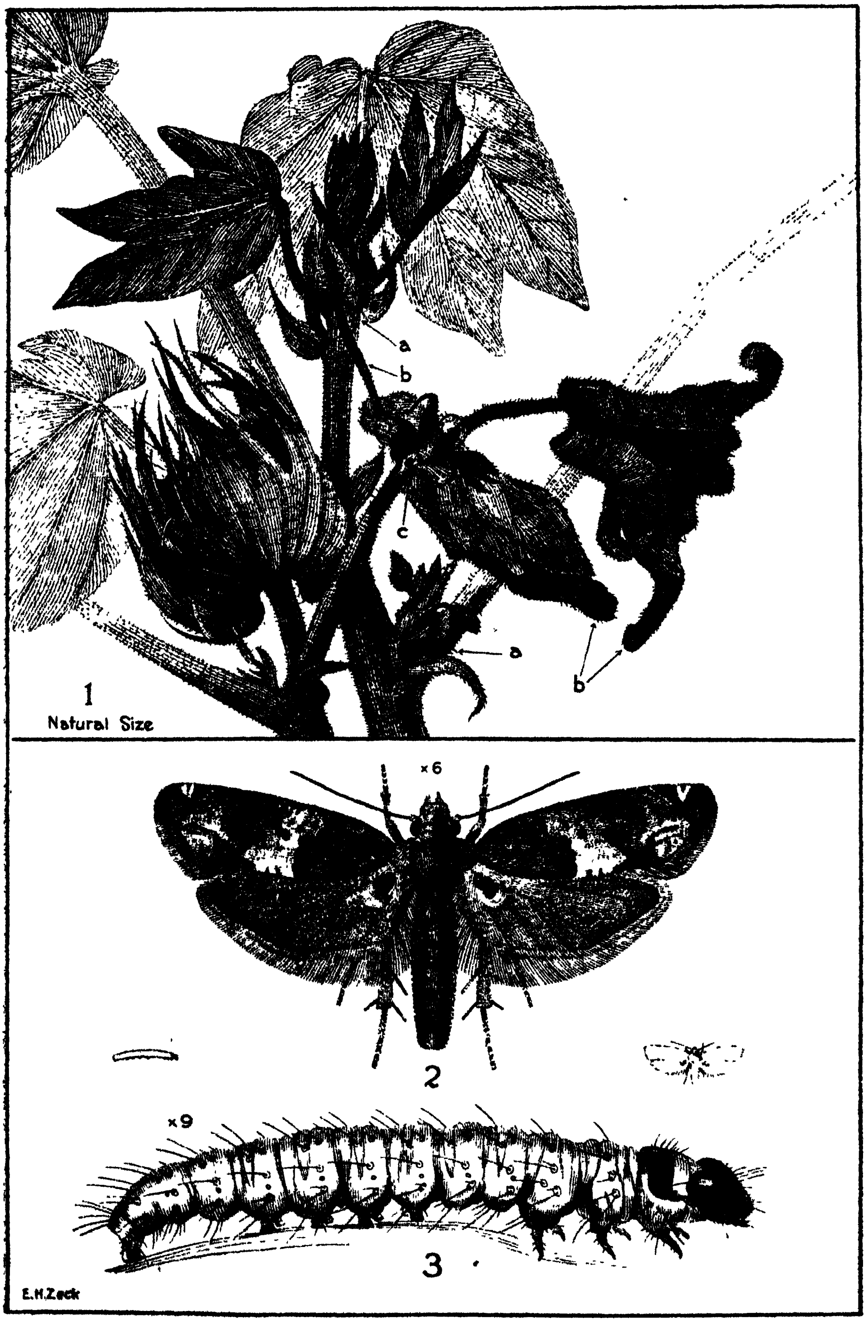


Fig. 19.—The Cotton Tip Moth (*Eucosma plebeiana*).

1.—Cotton plant damaged by Cotton Tip Moth caterpillars. (*a*) Damage and excrement at the crown of the shoot; (*b*) Wilted leaves and petiole; (*c*) Entrance hole of caterpillar.
2.—Moth (natural size indicated at right). 3.—Caterpillar (natural size indicated at left).

Meyrick records it also from Queensland at Brisbane, Durainga, and Townsville, and from South and Western Australia. Meyrick gives a technical redescription of this species in the ***Proceedings of the Linnean Society of New South Wales,*** 1881–2, page 659.

The moth is a small brown insignificant insect, only about half an inch across the outspread wings, while the body is only a quarter of an inch in length. The fore-wings are brown with several darker angular brown patches. The hind-wings are a pale smoky brown. The adult moths are recorded as being attracted to lights at night, which fact suggests one possible control method, viz., trapping the adults by flames at night.

Fig. 20.—Tip of Cotton Plant attacked by Cotton Tip Moth.
(*a*) Wilted leaves. (*b*) Entrance and excrement of caterpillar.

The caterpillar is a small white grub, sometimes smoky white, with a small black head, and a shiny black plate on the segment behind the head. The position of the legs and the scattered hairs on the body are indicated in the figure. These grubs tunnel in the tissue and some are very minute, only about a sixth of an inch, though they increase in size, attaining a length when full grown of just over one-third of an inch (9.4 mm.).

Damage.—The damage to the plant is wholly caused by the tiny caterpillars, which feed on and bore into the terminals and laterals, destroying many leaf buds and crowns of stems, and boring for short distances into the petioles of the leaves. The result is a characteristic shrivelling of many of the leaf buds and terminal leaves, which soon turn brown, and though some fall off other dead leaves remain clinging to the stems as a signal of the

presence of the little grubs. This damage has led me to propose the name "the Cotton Tip moth" for this new pest of cotton. The chief damage was noted in the months January to April in 1923 and 1924, especially in cotton plots in county Cumberland, and during these months and even in May the caterpillars were obtained by the writer in cultivated hibiscus flowers at Sydney. In January and February they were found attacking cotton at Grafton.

Fig. 21.—Another terminal damaged by Cotton Tip Moth at (*b*). The light patches on the leaves indicate the damage done by Red Spider (*Tetranychus bimaculatus*).

While not doing serious damage, under favourable conditions the pest may become more serious, and in view of the widespread range of the moth in the State it is proposed to give some attention during this coming season to the habits, number of broods, and possible methods of control,

The caterpillar, adult moth, and the characteristic damage which the grub causes to the cotton plant, are figured in the accompanying illustration.

Cotton Semi-looper Caterpillar (*Anomis* (*Cosmophila*) *erosa*, Hubner).

The caterpillar of this moth (Family *Noctuidæ*) is now recorded for the first time as attacking cotton in New South Wales, though it has been recorded as sometimes attacking cotton in the United States. The damage done by the caterpillar in North Coast districts during the past summer has merely been riddling the foliage of the plant with small holes. It cannot be said to have assumed pest proportions or to offer any serious menace at present, but it is well to record this possible pest of cotton in this State. We have specimens in our collections obtained from the Clarence River as far back as 1895, showing that the moth has been introduced and established for over twenty-five years in this State. In America Chittenden describes it as Abutilon moth feeding on the flowering maple (*Abutilon striatum*); other food hosts in America are various species of hibiscus, a *Malva* sp., and the bell pepper (*Pepperomia* sp.). Both Chittenden and Dozier give notes on the food and life history of this species. They record the young larvæ skeletonising the leaves, while the larger larvæ eat out large holes in the leaves. It is noteworthy that on hibiscus the larvæ are recorded eating into the flower buds and destroying them, which suggests the possibility of them attacking the flowers and bolls of cotton

Its distribution is Australia, South Africa, Madagascar, Mauritius, Southern Asia, and North America.

Life History.— The life stages of this moth according to Riley, Chittenden, and Dozier are as follows —

The adult moths are bright brown in colour, and the outer margins of the front wings scalloped and angular. The wing expanse is about 1½ inches, and the female is somewhat the larger. The female lays over a hundred eggs, usually at night, and deposits them on the leaves. Incubation is about four days, and the larval stages occupy about twenty-four days, during which time there are six moults. The caterpillars are in most stages of a general green colour, have only four pairs of prolegs on the hind body, and move by a slight looping action. When full-grown the caterpillar folds over a leaf and pupates therein, and in about six or seven days later the pupa changes to the moth.

The pupæ which we have from the northern rivers of this State are of a very deep red-brown colour, and we have fortunately developed from them a useful internal Chalcid wasp parasite. This parasite may prove a useful control. and it is being studied as to its identification and value.

Control.—Some control was gained in America by Chittenden, who used nicotine sulphate spray to destroy the caterpillars on the flowering maple. On cotton it would seem arsenic dusts would be more effective.

(*To be continued.*)

Suppurative Otitis.

A Disease affecting the Ear of Pigs.

H. R. SEDDON, D.V.Sc., and H. R. CARNE, B V.Sc.,
Veterinary Research Station, Glenfield.

A condition has been noticed fairly commonly among young pigs in which the most prominent symptom is a peculiar alteration in the carriage of the head, which is accompanied frequently by unsteadiness of gait.

The disease is seen usually in young pigs from a few weeks up to three or four months old. The reason for the relative infrequency of occurrence in older pigs is possibly that young pigs are more prone to catarrh (which appears to be the forerunner of the condition), and that affected animals suffer such loss of condition that they die or are killed as "runts" or "bad doers."

Symptoms.

The most characteristic symptoms are the abnormal method of carriage of the head and the interference with equilibrium and sense of direction. The head is twisted or rotated to one side or the other so that one ear (the affected one) is depressed, such depression becoming more marked as the condition advances. It is noticed that the animal when walking about tends to circle in one direction, this being towards the side to which the head is depressed. For example, if the left ear is affected, the head will be rotated to the left with depression of the left ear and "circling" will occur in the same direction. At times this tendency to circle is not apparent, but it is noticed that when moving the animal does so with an awkward gait, while the head is moved from side to side in an unbalanced manner. Affected animals may also exhibit considerable difficulty in going straight up to the feeding trough, having to make several attempts before gauging the right direction, sometimes walking to one side of the trough and sometimes to the other. It has frequently been noticed that the condition is accompanied by discharge from the nostrils and eyes.

In advanced cases there are very apparent disorders of equilibrium, the gait becoming unsteady and somewhat inco-ordinated, and the animals may fall into the feed-trough and be unable to get out again.

Affected pigs are usually found to be "poor doers," showing a scurfy condition of the skin, lack of lustre of the hair, and poor condition. The appetite is capricious.

In some cases examination of the affected ear reveals a considerable amount of yellowish-brown or brown, sticky discharge adhering to the inner surface of the ear.

Cause and Lesions.

Examination of several pigs showing such symptoms has revealed the presence of a suppurative condition affecting the middle ear, and this may be the only demonstrable pathological change found on post mortem examination.

The hearing apparatus, it may be mentioned, consists essentially of three parts:—

(1) The external ear, which is that portion visible externally. Its function is to collect sound waves and transmit them by means of a passage to—

(2) The middle ear. This is separated from the external ear by the tympanic membrane or "ear-drum." The function of the middle ear is to magnify the sound waves collected by the external ear and transmit them to—

(3) The internal ear. This consists of an intricate structure by which the sound impressions are transmitted to the sensory areas of the brain. The internal ear, however, performs another very important function, namely, the maintenance of equilibrium, it being by means of part of this structure that an animal keeps its balance.

Disease of these deeper structures of the ear, therefore, frequently leads to an unsteady gait, twisting of the head to one side, or even to inability to stand at all.

Both the middle and internal ear are situated within the petrous-temporal bone of the skull, and it is within this bone that the lesions responsible for the condition are found. The petrous-temporal bones are placed immediately behind the articulations of the lower jaws and the skull, but a careful dissection, aided by sawing open the skull along the longitudinal mid-line and removal of the brain, is necessary to expose them properly.

In several cases so examined it has been found that a thick cheesy material is present in the cavities of the bulbous portion (*bulla ossea*) of the middle ear on that side to which the head has been depressed during life. Normally these cavities in the bone have a honeycombed appearance, consisting as they do of small empty spaces separated by thin plates of bone.

The accumulated pus in the middle ear tends to burst through the ear drum and discharge externally, giving rise to the sticky discharge which may, in advanced cases, be seen on examination of the passage in the external ear.

Examination of the pus shows the presence of bacteria, such as are commonly met with in other suppurative conditions in the pig. It is probable that in these cases they gain entrance to the deeper structures of the ear by way of a narrower passage (called the Eustachian tube), which leads from the back of the throat to the middle ear, and from the comparative frequence of nasal catarrh in young pigs it is probable that this ear-disease is an extension of this inflammatory process affecting the lining membrane of the nasal passages.

Prevention and Treatment.

Once the condition is established it is unlikely that any treatment will be of use. Syringing of the outer ear will remove the obvious discharge, but will not penetrate into the deeper structures from which the pus arises.

While the disease cannot be definitely prevented, all possible means, such as proper attention to cleanliness and housing, should be undertaken in order that chills may be avoided. Diet should also be attended to, as it is found that this also plays a not unimportant part in the causation of those diseases, such as catarrh ("snuffles") and pneumonia, with which the condition is frequently associated.

Molasses Grass.

(*Melinis minutiflora*, Beauv.).

J. N. WHITTET, Agrostologist.

RECENTLY a number of inquiries have been received from farmers asking about molasses grass and whether it has any value for grazing purposes. In reply the following particulars have been supplied :—

This grass has been referred to under a number of different names, such as Molasses, Stink, Brazilian Stink, &c. Its correct botanical name, however, is *Melinis minutiflora.* In western tropical Africa it is known as Efwatakala, and is supposed to be identical with the Godura of Brazil, and Yaragua of Colombia. It was introduced into this State many years ago, and has been grown at the various experiment farms here in order to test its value as a grazing proposition. Although in other parts of the world it has been reported as being of exceptional value in choking out scrub, &c., it has not proved useful with us in this respect; in fact on the Northern Rivers *Paspalum dilatatum* overruns *Melinis minutiflora.*

We have also found that stock are not partial to this plant, mainly because it is extremely hairy; the hairs exude a sticky oil which has a strong musky odour. Stock as a general rule do not find strong-smelling plants palatable, and invariably refuse to eat them.

Molasses grass is a summer grower, and in districts where heavy frosts are experienced the plants are cut back. Being a tropical grass, it requires a long summer season with heavy rainfall and good soil conditions to produce a large amount of growth.

Recently reports from tropical Africa and South America have come to hand which state that ticks and tsetse flies find the grass objectionable, probably owing to the oil exuded by the hairs. In a recent issue of Kew *Bulletin*, England, information to this effect is given; some collectors even going so far as to state that when the grass is growing in any quantity its odour is very offensive to human beings.

Cattle feeding on this grass are reported to be less subject to ticks, and in tropical Africa the tsetse fly is supposed to be ensnared by the sticky oil exuded by the plant. An old report from Brazil stated that both cattle and horses were fond of this grass, but although they soon fattened on it the latter got short-winded if feeding on the plant for any length of time.

The matter of planting this grass in tick-infested areas in New South Wales has received consideration, but as it requires very good soil conditions and will not withstand the crowding out effect of paspalum, the test would prove ineffective; the fact that in New South Wales stock do not eat it readily should also be considered before extensive areas are planted.

The grass forms very small, light seed, but the main methods of propagation are by planting rooted cuttings, runners, or divisions of the main root system.

Molasses Grass (*Melinis minutiflora*, Beauv.).

1. A single spikelet 2. Empty outer glumes of a spikelet. 3 Fruiting glumes of a spikelet, with ovarium.

The Infectivity of Rinderpest.

THE REMOVAL OF RESTRICTIONS ON INTERSTATE TRADE.

MAX HENRY, M.R.C V.S., B.V. Sc., Chief Veterinary Surgeon.*

THE fact that the Commonwealth Government has considered it safe to remove all restrictions on the introduction of live stock, animal products, and other materials from Western Australia to other States, at what may be considered a comparatively recent time after the eradication of the outbreak of rinderpest, has probably occasioned some surprise, but if the history of recent outbreaks of rinderpest is studied, and the experimental work which has been carried out in connection with the persistence of the virus of that disease outside the animal body is looked into, it will be seen that its action is fully justified.

It is only within comparatively recent years that precise experiments have been carried out regarding the vitality of the rinderpest virus outside the animal body under natural conditions. The most extensive work has been carried out in India and the Philippine Islands. Shilston,[1] Veterinary Pathologist of the Muktesar Laboratory, India, conducted an extensive series of experiments, from which he was able to draw the following conclusions:—

"(1). At Muktesar fæces and urine collected from animals suffering from rinderpest during the later stages of the disease and stored in the shade at air temperatures varying from 54 to 73 deg. Fah. remained infective to healthy animals up to fifty-four hours after collection, but frequently these materials become non-infective after shorter intervals. In the plains at slightly higher temperatures, fæces and urine were found to be non-infective beyond thirty-six hours.

"These observations confirm the results obtained by exposure of healthy cattle in sheds, and in enclosures shaded by trees at intervals after the removal of sick animals.

"(2). When exposed to direct sunlight the virus survived in mixed fæces and urine for eight hours, but not for twelve hours; in the same materials kept in the shade the virus survived for thirty-six hours. The results obtained in infected enclosures, without shade, are therefore confirmed.

"(3.) The rinderpest virus survived in mixed saliva and nasal discharge, kept at room temperature, for forty-four hours. It appeared to be less resistant in these discharges than in fæces and urine, since in one observation the infectiveness of saliva and nasal discharge was lost forty-eight hours after collection, although fæces and urine from the same animal remained infective for fifty-four hours."

* Text of a report submitted to the Minister for Agriculture, the Hon. F. A. Chaffey.

He also endeavoured to show how long virus survived in meat, bones, etc., and his conclusions were as follows :—

"(1). The length of time that the rinderpest virus is able to survive in blood from a sick animal, kept at air temperature in an open vessel, varies within wide limits. In one observation such blood was non-infective after three days' exposure, while in another it remained infective for fifty-one days, although putrefaction set in after a few days' exposure, and by the thirtieth day the blood was completely desiccated. In two other observations blood was still infective after nine days' exposure to the air, and in a third it was infective after seven days, but non infective after nine days' exposure.

"(2). In two observations the virus maintained its vitality in bone marrow for nine days, but in one of these cases infectiveness was lost after fifteen days.

"(3). Meat was infective after three days in one observation, when blood from the same animal was non-infective within that period; in another case meat remained infective for five days.

"(4.) Further tests are necessary to determine the factors influencing the survival of the rinderpest virus in animal tissues under natural conditions; the temperature at which the material is kept appears to have a considerable effect, possibly in determining the rate and character of the putrefactive changes taking place, but it has been shown that these may not destroy the virus as rapidly as many authorities have stated to be the case."

This work of Shilston's was carried out partly with the idea of confirming previous experimental work, since his results were somewhat at variance with popular ideas on the subject. Many observers, however, had come to the conclusion that virulent material did not remain active for long. Stockman, working in South Africa,[2] stated that virulent material does not remain active for more than a day or two outside the animal body, and Turkish investigators have stated[3] that they regard rinderpest virus as essentially fragile and incapable of development in external media.

In 1914 the workers in the Philippine Islands[4] carried out several sets of experiments and arrived at the following conclusions :—

"(1). Rinderpest virus was not shown to have survived beyond twenty-four hours in corrals bare of vegetation but containing water. The conditions under which tests were made included all seasons of the year, with accompanying variation in sunlight, rain, and condition of the soil. The amount of shade varied widely.

"(2). Animals became infected in such corrals within half-an-hour, twelve hours, and seventeen and a half, respectively, after removal of the sick.

"(3). Animals infected with rinderpest were shown to be capable of transmitting the disease to susceptible animals by close contact only during the febrile period of the disease, and most certainly during the period in which the temperature was declining. The disease was not contracted by susceptible animals when exposed to sick animals during the convalescent stage when the temperature was nearly normal.

"(4). Blood of animals infected with rinderpest was shown in two cases to be infected during the height of the febrile period.

"(5). The virus in urine, diluted with water and sprinkled on grass, was demonstrated to survive for thirty-six hours in some instances, but not always, and not for a longer period of time.

"(6). Fæces mixed with water and sprinkled on grass infected an animal twenty-four hours later.

"(7). Fæces and urine diluted with water and kept in a vessel in the shade remained infective for susceptible animals for thirty-six hours, but no longer.

"(8). No evidence was secured to show that recovered cases transmit the disease.

"(9). The foregoing facts indicate that the virus of rinderpest perishes soon after being discharged by the infected animal.

"(10). Nothing in the foregoing experiments indicates that rinderpest virus is harboured for long periods upon the soil of contaminated areas."

An opportunity of testing these statements by actual work in the field in countries in which rinderpest was not endemic occurred in 1920, when the importation of certain cattle into Belgium[5] from British India occasioned a widespread outbreak in the former country. The cattle arrived in Belgium at the end of June, and by 15th August 150 farms had become affected, yet so effective was the Belgian control that the disease was stamped out in October. As the whole history and source of disease was under expert observation throughout its course, the conclusions drawn by the Belgian and French authorities are of particular interest, and in the report of the outbreak in the French *Veterinary Journal* the following occurs :—

> "The observations recorded show that the creation of new centres of infection was caused in nearly every case by the fraudulent or accidental movement of contaminated animals; in some simply by moving uncooked fresh meat. On the other hand, the disease was not spread by any of the indirect methods of contagion mentioned in all the authorities. Living intermediaries, such as man, non-susceptible animals, &c., play a small part or none at all, and precise observations have shown that flies do not transmit the virus."

The outbreak of rinderpest in Western Australia has offered a further opportunity of confirming the views of Shilston and the Philippine authorities, since healthy cattle which were taken on to Rottnest Island (where a number of cattle had died from the disease) very shortly after the last death remained healthy, and it is evident from the reports on hand that infection is associated with an actually infected animal almost entirely.

It should be noted that the virus of rinderpest does not live in the ground like the causal organisms of anthrax, black-quarter, or hæmorrhagic septicæmia, and consequently the fear that a once-infected farm may remain infected for years, as in the case of anthrax, is not warranted.

The hot, dry climate of Australia is distinctly favourable to any attempt to control rinderpest.

Although the method of the introduction of rinderpest into Western Australia has not been officially announced, it is difficult to believe that it could be due to anything except a living animal or material recently contaminated by a diseased animal. There is evidently still a fear in the minds of the farmers that South African maize, or similar materials, might be responsible; but quite apart from the fact that rinderpest has been unknown in South Africa for the past twenty years, it is unlikely that any material which had undergone such a long voyage could be responsible for its introduction.

Again, it may be pointed out that the period of incubation—that is to say, the time elapsing between the infection of the animal and the display of symptoms—is short, varying from about three days in severe cases to ten days in milder, but averaging about six.

It has been pointed out that in other countries rinderpest is described as smouldering and suddenly breaking out, but it must be remembered that in the countries in which such reference is made the disease is endemic. Many of the animals are partially immune, or at all events only slightly susceptible, whereas in a country in which it breaks out for the first time the live stock are particularly susceptible, and would show symptoms indicative of severe cases with much greater regularity.

From the facts cited above, it will be evident that the Commonwealth Government has acted in accordance with definite scientific knowledge, gained as a result of experimentation. It is inconceivable that the prohibitions would have been lifted had the authorities considered that there existed any danger of the disease spreading from Western Australia to the other States.

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[2] Stockman.—"Note on the Methods of Combating Rinderpest.—*Jour. Comp. Path. and Ther.*, vol. xviii, 1905, p. 208

[3] Refik Bey and Refik Bey.—"La peste bovine en Turquine;" *Ann. Inst. Pasteur*, vol. xiii, 1899, p. 600.

[4] A. R Ward, F. W. Wood, and W. H. Boynton.—"Experiments upon the Transmission of Rinderpest;" Bull. 30, Bureau of Agriculture, Philippine Islands, 1914.

[5] *Jour. Comp. Path. and Ther.*, Mar, 1921, quoting *Rev. Gen. de Med Vet.*, T xxix, 1920, p. 577.

White Ants in the Orchard.

In localities where white ants are prevalent it is desirable to cultivate a crop before planting fruit trees. In any case it is a good plan to do that first, but if it is not possible, the land should be ploughed early so that the soil is exposed to weather influences for some time before planting is carried out.

The land should be thoroughly cleared, of course, all roots being run to a proper depth, and all pieces of timber removed or burnt. In localities where white ants are troublesome stakes should not be used to support trees unless such stakes have first been treated with an effective white ant exterminating dressing; nor should use be made of mulches such as bush scrapings, grass, &c. Thorough cultivation helps to keep white ants in check.—H. Broadfoot, Assistant Fruit Expert.

The Queen Bee Competition at Wauchope.

A Non-swarming Test

W. A. GOODACRE, Senior Apicultural Instructor.

It should be the aim of the practical apiarist to discourage swarming, and for this reason the non-swarming qualifications of the competing colonies must be a matter of careful consideration in any queen bee competition.

Not many years ago bee-farmers depended upon the swarming of their bees to provide increase, and much was done to encourage swarming. Artificial methods of obtaining increase, however, have reversed the position entirely. There are various reasons why swarming should be discouraged. It is not convenient, for instance, for the bee-keeper to be always on the look-out for swarms, more especially in out-apiary work. Again, the bees may swarm, and thus divide their working force at a period when the best results could be obtained by keeping the whole colony intact. Nor may increase be desired by the apiarist at the period when the bees are inclined to provide it, while there is always the risk of losing the swarm.

To be successful in swarm control it is necessary to combine with selection in breeding a good system of management, working against those conditions which induce a colony to swarm. A colony with insufficient accommodation, for example, will surely endeavour to relieve the congestion in the hive. It is, therefore, necessary to provide ample hive accommodation. Good combs built from full sheets of comb-foundation in the brood chamber for the queen to lay in, and provision for the expansion of the brood nest as required by the colony in their building-up work, are both of help in swarm control. The comfort of the colony must also be considered, by the provision of ample ventilation and the shading of the entrance to the hive during hot weather. Colonies with young queens are less disposed to swarm than colonies with old queens.

A number of the competing colonies did not attain a sufficiently populous condition to provide a test. The more populous colonies were subjected to conditions conducive to swarming (that is, stimulating conditions for brood-raising) for a good period of the working season. Mr. L. Smart's colonies Nos. 14 and 15 were the only two to develop swarming tendencies. No. 14 made ardent preparation by building queen cells, but the issue of the swarm was prevented when the swarm cells were destroyed and their surplus honey extracted. In the case of No. 15 the swarm issued regardless of preventive measures. It is of interest to note that in the two colonies referred to the worker bees show cross-mating. In other cases, where both the queen and her progeny are pure, tested under similar conditions, no swarming tendency was evident.

The points awarded for non-swarming qualities (maximum 100) were as follows:—

G. G. Phillips—No. 16, 90; No. 17, no test; No. 18, 90; total, 180 points.
E. J. Gibbs—No. 1, 90; No. 2, no test; No. 3, 90; total, 180 points.
L. Smart—No. 13, no test; No. 14, 80; No. 15, 70; total, 150 points.
F. Coleman—No. 10, no test; No. 11, no test; No. 12, 90; total, 90 points.
G. James—No. 4, no test; No. 5, no test; No. 6 no test; total, nil.
Cushan Bros.—No. 7, no test; No. 8, no test; No. 9, no test; total, nil.

Queen No. 6 was giving good results in this test, but owing to supersedure near the close of the season, a no-test result had to be given.

THE COMMERCIAL SIDE OF FARMING.

THE farmer's efforts have principally been directed towards increased production, but he has reached a stage when he must give increased attention to the business side of farming if he is to receive profitable returns. The Australian farmer produces more than he requires, and has to sell in the markets of the world against competitors whose labour costs are lower. The Government cannot assume the position of selling agent—its intention is to co-operate with farmers and to help them to help themselves. Co-operation among farmers is not only desirable, but most essential. Secondary producers co-operate to secure profitable prices for their goods, and their employees co-operate to secure an adequate return for their labour. Farmers must also combine and organise in such a way as to prevent the middleman from exploiting them and reducing the farmer's profit by an amount exceeding the value of the service rendered.—A. H. E. MCDONALD, Chief Inspector of Agriculture, at the Maitland Bureau Conference

FARMING FOR A DRY YEAR.

SINCE crops are more valuable per unit to the farmer in poor seasons, it is sound business to make a special effort to grow as good ones as possible in the off years. Consider what it means to buy seed and feed when seed is scarce, when hay prices go soaring in cyclonic gyrations, and when even a pile of wheat straw becomes an object of envy. . . . Few farmers are able to tide over comfortably a period of failure. It generally means borrowing, and this too often proves a slip noose. . . . .

There must, of course, be reason in all things. It does not do to become obsessed with any single idea—even so important a one as moisture. Other things have to be considered; and then, too, one cannot afford to practise garden culture in growing 60 cent wheat. But observation convinces us that many a western farmer would be better off to put his time on fewer acres and farm for surer results.—W. D. ALBRIGHT, in *Seasonable Hints*, Canadian Department of Agriculture.

Fumigation with Liquid Hydrocyanic Acid.

A Comparison of Costs.

A. A. RAMSAY, Chemist.

A NUMBER of years have passed since fumigation as a method of controlling scale insects on citrus trees in this State was introduced by Mr. W. J Allen, Fruit Expert. The directions as to the procedure were the result of careful experiment, and the tables indicating the quantities of materials necessary for different sized trees are still the standard among citrus growers who employ this method of control.

In an effort to encourage the practice of "cyaniding" as against merely spraying, and to improve upon a method which has already been successfully operated by orchardists in New South Wales and America, and which only requires a little care to produce eminently successful results, other sources of hydrocyanic acid gas have been suggested, namely, liquid hydrocyanic acid and calcium cyanide. The claims of the latter in this relation it is not intended to discuss. As to the liquid hydrocyanic acid, its use by local orchardists is practically prohibited by reason of two facts—that the dangerous nature of the article prevents its transport in any bulk quantity, and that the risk attending its preparation has so far operated against its commercial manufacture in New South Wales.

Such difficulty in transport, it was contended by a firm of manufacturers elsewhere in recent correspondence with the Department, does not apply to a perfectly pure product—a 100 per cent. pure liquid cyanide such as the firm produced had been shipped by them and railed considerable distances. The Department was invited to investigate the claims for the superiority of the article as made in accompanying literature.

The Question of Purity.

Experiences in California show that about 78 per cent. of the total hydrocyanic acid present in sodium cyanide is recovered as liquid hydrocyanic acid of 95 to 98 per cent. purity. This low recovery will necessarily make the price of the liquid hydrocyanic acid relatively high. In the pot system—that is, using cyanide and sulphuric acid—90 per cent. of the theoretical hydrocyanic present is obtained and is effective. Absolutely pure liquid hydrocyanic acid does not undergo change, but the presence of the merest traces of certain substances causes decomposition to take place, and it appears extremely unlikely that the product referred to is absolutely 100 per cent. pure. Professor H. J. Quayle, University of California, finds that *a 95 per cent. grade is very satisfactory, and states that he is as yet undecided as to the

* Bull. 308, "Fumigation with Liquid Hydrocyanic Acid," University of California, June. 1919.

comparative merits of 95 per cent. acid as against 98 per cent. or more. It is even maintained by some fumigators that the high percentage liquid is too volatile for safe handling, and they much prefer 95 to 96 per cent.

Costs Compared.

The following table shows the relative costs of fumigating by the liquid cyanide and the departmental method, also the dose in cubic centimetres of the liquid acid used as compared with the quantity of cyanide used by the Department:—

Height and diameter of tree	Liquid cyanide treatment		Departmental treatment					Relative cost of liquid cyanide treatment (departmental treatment taken as 100).
	Dose required.	Cost per tree	Dose cyanide required		Cost per tree of cyanide and acid			
			Table I	Table II	Table I	Table II	Average	
feet.	c.c	d	oz	oz	d	d	d.	
4 x 4	6	3 312	¾	¾	772	772	·772	429
5 x 5	9	3·600	¾	¾	772	·772	·772	429
6 x 6	12	4 800	1	1	1·031	1·031	1 031	465 5
7 x 7	18	7·200	1¼	1½	1·289	1 547	1 419	507 4
8 x 8	24	9 600	1¾	2	1 804	2 062	1·933	496 6
9 x 9	36	12·000	2⅝	3	2 749	3·093	2·921	410·8
10 x 10	48	14 400	3½	4	3 609	4·124	3 867	372 3
11 x 11	60	16 800	4¾	5½	4·897	5 670	5·284	317·9
12 x 12	72	19 200	6¼	7	6 443	7 217	6 830	281·1
13 x 13	90	24·000	7¾	9	7 990	9 279	8·634	277 9

In computing the above costs, the prices obtaining for the liquid cyanide in the country of its origin have been taken, it being considered unlikely that the product would be produced at a cheaper rate in New South Wales, while the cost would be much higher if it were shipped to this State. The prices for cyanide and sulphuric acid are those at present obtaining.

It will be seen that the liquid cyanide treatment thus ranges from two and three-quarters to five times as much as the departmental method.

Californian experience of the action of this liquid hydrocyanic acid on metals does not support statements in the literature referred to, nor do the dosages recommended conform with those of experience elsewhere.

Lime as a Disinfectant.

"Is air-slaked lime of any value as a disinfectant?" was the question put to the Department recently. The correspondent was informed that in the ordinary acceptance of the word disinfectant—that is, as an agent capable of freeing from infection by pathogenic germs—lime or air-slaked lime can scarcely be so described. If the term were to be used in a broader sense, however, as descriptive of an agent that will clean up or sweeten and kill certain growths, then lime or freshly-slaked lime may be said to have a value as a disinfectant. Air-slaked lime that has not been kept for any considerable time is practically calcium hydroxide; its solution in water has an alkaline reaction, and has a weak but decided action on spores of fungi. Liming of fruit trees by painting with milk of lime frees the trees from parasites and lichen growths. Liming or whitewashing of buildings and outhouses is practised to sweeten them and free them from contamination.—A. A. Ramsay, Chemist.

A Fungus and Some of its Host Plants.

(*Sclerotium rolfsii*, Sacc.).

W. A. BIRMINGHAM, Assistant Biologist.

SOUTHERN blight, due to the fungus *Sclerotium rolfsii* (Sacc.), attacks a large variety of hosts and grows on almost anything, living or dead. During the year 1920 specimens of diseased potato and carnation plants were submitted to the Biological Branch for examination. Both plants were attacked by *Sclerotium rolfsii* (see Figs. 1 and 2). In the case of the potatoes the grower stated that about 10 per cent. of the crop was affected. Early in 1921 the same grower submitted specimens of rhubarb attacked by the same fungus (see Fig. 3).

Fig. 1.—*Sclerotium rolfsii* on potato stem.

The loss in carnations due to the disease was 40 to 70 per cent. of the plants. The specimens were attacked at and below the ground line with a white cottony fungus which later formed white spherical sclerotia about the size of mustard seed. These sclerotia later turned yellow and then brown. The stems of the plants were girdled and the whole of the tissues in a decaying state. Plants attacked suddenly collapse. *S. rolfsii* was found by Small associated with a wilt of carnations, Kampala, May, 1919.

Some years previous to 1920, specimens of French beans (see Fig. 4), yams, and banana fruit were found attacked by the same fungus. The yams were imported from China and the bananas from Fiji. In the case of the beans the sclerotia had spread some considerable distance up the stem. The fungus was isolated from French beans in 1915. It has been growing in the laboratory since that time on corn-meal agar. No conidial or other stage has been observed.

Sclerotium rolfsii was found in January, 1921, growing on a decaying fallen apple in an orchard at Beecroft. Earle and Rogers record it as producing a rot of citrus fruits when they come in actual contact with the soil.

Fig. 2.—*Sclerotium rolfsii* on carnation.

Fig. 3.—*Sclerotium rolfsii* on rhubarb.

Fig. 4. *Sclerotium rolfsii* on French beans.

Fig. 5.—*Sclerotium rolfsii* on antirrhinum.

Wolf records it as the cause of death of seedling grape fruits in Alabama. In March, 1921, Dr. R. J. Noble, Assistant Biologist, handed me an antirrhinum plant attacked by the same fungus (see Fig. 5). This fungus seems almost omnivorous, having been recorded from various hosts. It possesses a very aggressive mycelium, which under moist conditions grows, as already remarked, on almost anything.

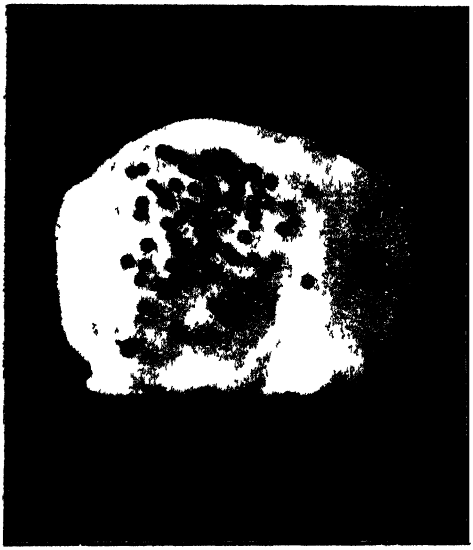

Fig 6.—*Sclerotium rolfsii* on cotton wool from moist chamber.

Fig. 6 shows sclerotia formed on moist cotton wool from a glass chamber containing the potato specimen shown in Fig. 1.

Sclerotium rolfsii has been previously recorded from the following: – Tomato, egg-plant, potato, sweet potato, beet, squash, watermelon, cantaloupe, rhubarb, cauliflower, cowpea, carrot, fig, cotton, violet, hydrangea, daphne, chrysanthemum, morning glory, Japanese fibre plant, tobacco, grasses, weeds, citrus fruits and seedling grape fruits. Mr. E. Cheel, of Sydney Botanical Gardens, has informed me that he has received from Goulburn a delphinium plant attacked by *S. rolfsii.*

Control.—Taubenhaus recommends the removal and burning of diseased plants and drenching of the areas from which they have been removed with a solution of 1 lb. of bluestone dissolved in seven gallons of water.

The photographs illustrating this article were taken by Mr. W. J. Reay.

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Poultry Notes.

JUNE.

JAMES HADLINGTON, Poultry Expert.

THE hatching season is again with us, and no time should be lost in making a start to put down eggs. Every farmer requires a certain number of breeding stock to come in for each year, and the time to hatch them out is during June and July. It is well understood that many poultry-farmers have a preference for two-year-old breeding hens, and while there is much to be said in favour of them, not the least is the fact that from them tested or proven hens can be selected as breeders. This consideration is, of course, an important one, especially when good material is available that has justified expectations, either in egg-laying ability or in other desirable traits of character, but this applies equally to three or even four-year-old birds, male or female. Unfortunately it does not get over the disability attaching to aged birds as breeding stock.

The difficulty with which the commercial poultry-farmer is faced is that, whatever objective he may have in view in the way of special breeding, he cannot afford to have the bulk of his output of chickens late-hatched. That would spell ruin or serious loss to his farm, though many farms are so ruined or crippled. Experience proves that to secure the required proportion of early chickens one must use some pullets and cockerels as breeders. In this connection the ideal mating is, of course, second-year male birds with pullets. This usually works well enough with light breeds, but it not infrequently is the case that second-year males of the heavy breeds prove too sluggish until the warm days of August. In such circumstances one arrives at the same point as if the breeding were from old hens, which are slow to come on to lay.

The reason usually advanced against using pullets and cockerels as breeders is that they are immature, and that the progeny may not be as strong as that from older birds. This idea is only sound when applied to very young or poorly developed birds. In the first place, the latter should not under any circumstances, or at any age, be used as breeders, but with regard to age, experience abundantly proves that good vigorous birds of ten months of age and over (which means early-hatched birds of the previous rearing season) can be relied upon to produce progeny as strong and virile as at any age, and even more so than birds over two years old.

Essential Conditions.

Apart altogether from such considerations, as strain, relationship, &c., there are other essentials required in stock that are to be bred from. Aged birds should be quite through the moult a full month or more before eggs are required from them. This stipulation would, for all practical

purposes, and as far as the production of breeding stock is concerned, cut out the very late moulter, yet it is the late moulter that many are striving to breed from because of its high producing qualities. But let us examine this matter.

Admittedly, the hens that lay late and consequently moult late are valuable hens to have, and it is most undesirable that hens should moult too early, as hens that do so are invariably poor layers—unless, as often happens, it is unskilful treatment in feeding and housing that has been responsible for their condition. As far as layers are concerned, the later the moult is deferred the later they will continue to lay, but at present we are concerned with them as breeders. Here is where we cannot have the cake and eat it. If hens lay on without moulting until the breeding season, no matter how good their egg-laying performances have been they are not from other considerations fit to use as breeders. Poor quality eggs usually result from continued laying when the hens should be moulting, and in consequence what eggs are hatchable result in weedy chickens that are too difficult to rear. Let poultry-farmers not deceive themselves. Good chickens cannot be secured from run-down breeding stock, and only good chickens can in the ultimate issue become profitable.

As regards very aged stock, the only justification for breeding from three- or four-year-old hens is that they have produced exceptionally good progeny, or that they are essertial to the maintenance of a line of blood that has proved satisfactory, or that they are required for outcrossing to start new lines. In the case of pullets and cockerels to be bred from, they should be selected with even greater care than the older birds about which something is known, because in the absence of previous performances the breeder in this case is relying mostly on his judgment in selection, plus perhaps some knowledge of ancestry. But let no breeder imagine that pedigree is sufficient in itself. Pedigree stands for nothing if the birds themselves are lacking in the essentials of breed, character, stamina, and physique. Weakly specimens, no matter what their breeding, are incapable of transmitting the best qualities of their ancestors. It is therefore necessary that a selector keep in mind all that it is desired to perpetuate If such is not visible in the specimens there is but little chance of producing them. In addition the birds should be of good weight and of the age required (not less than ten months).

Spring Chickens.

The lesson of last spring should not be lost upon farmers who opine that it does not pay to rear the cockerels. Those who last spring were making 7s. 6d. to 10s. 6d. per pair for chickens of eight to ten weeks old are not likely to throw their cockerels away on that plea, but others who did not participate in these prices may keep to their old idea and dispose of the cockerel chickens, treating them as of no value. Many thousands of pounds were lost to poultry-farmers last year in this way, and the public were deprived of a most valuable article of food for which they were willing to—and did—pay fancy prices.

In passing, it might be mentioned that in the judging of the farm competition a few months ago, I had exceptional opportunity for seeing how this policy had affected the income on some farms. In some cases the cockerel portion of the hatching had been literally thrown away, while in others the most had been made of them. The result went only to confirm what I have consistently advocated—namely, that cockerels should be reared to the age and weight at which they will bring the best prices. In the early spring months this may mean a couple of months old, while later on when the usual glut of small stuff is choking the market it may pay best to hold them to four or even six months old. Much however, depends upon the class of birds being kept. Weedy badly-reared stuff is a losing proposition no matter how or when marketed.

The crux of the question is, "Will it pay to rear the cockerels ?" A counter question is, "Will it pay to continue to hatch cockerels and lose money on them when it is possible to turn them into a profitable asset ?"

Reserves for Breeding Stock.

There is, however, a more serious side to the disposal of cockerels as very small chickens. Many farms came under notice where all the early cockerels had been sacrificed as soon as they could be distinguished from the pullet chickens. Some farmers had disposed of these and kept the later (August- and September-hatched) cockerels to come in for breeding stock. Surely this will be recognised as a mistake when the facts which are in evidence at this time of the year are before farmers.

The salvation of the poultry industry in a great measure depends upon sound, vigorous, and fully developed breeding stock, and this cannot be obtained from the end of the season's hatching. It is, therefore, imperative that some of the early-hatched birds be kept where breeding stock has to be provided for next year.

Another feature is that where say twenty cockerels are required as breeders, very often only a few over that number are kept. The consequence is that there can be no selection in the best sense of the term. As a matter of fact, every farmer who requires twenty cockerels should keep at least sixty of his best early chickens to the age of four or five months, so as to enable a good selection to be made. No matter how good the parent stock, cockerels required for breeding purposes should be saved on the basis of three to every one wanted. The policy of keeping only a few cockerels over requirements and then being forced to use them irrespective of the quality they grow into, is lowering the standard of birds kept on many farms. If birds cannot be kept in the proportion mentioned it would pay better to dispose of all male chickens and purchase requirements when the breeding season comes round.

This of course, raises the question of outcrossing versus line breeding, but it is infinitely better to outcross than to breed from inferior birds of the " home strain." Line, or inbreeding, with birds inferior to their ancestors

is a sure way to degeneracy in the flock. In this connection, many inquiries are made as to what relationships should be bred from. The answer is that, apart from other considerations, relationship is no guide in the matter. Whether a bird or birds should be bred from is not to be determined solely by the degree of relationship, but by the quality in type, character, and physique of the specimens to be mated. It is even more necessary to insist on these qualities being present in birds closely related than in those unrelated. Just as inbreeding is practised with the object of perpetuating and fixing good qualities, so will undesirable qualities be fixed and accentuated by mating inferior birds within the same lines of blood. Not only so, but once degeneracy is in evidence it is a mistake to attempt to resuscitate a strain that has been badly run down, even by outcrossing. It is far better to make a fresh start and work on improved lines in future, avoiding the pitfalls that have been the cause of failure in the past.

A noticeable feature in this regard is that many poultry-farmers are afraid to introduce new blood, or in other words to outcross, fearing that they will ruin their "home" strain, whereas it is already ruined or has no "super" qualities to safeguard. A different outlook in connection with these questions would do much to improve our flocks and make them more profitable.

PINK BOLL-WORM IN AUSTRALIA.

A GOOD deal of interest has been exhibited lately in the Pink Boll-worm (*Platyedra gossypiella*); various reports have been published as to its presence in parts of Australia, and concern has been expressed as to its possible extension to New South Wales.

It may be remarked that it was recorded from Queensland by Dr. Jefferis Turner in the *Proceedings of the Royal Society of Queensland* in 1919, and since then it has been recorded by Hill, in the Northern Territory, and more recently from Western Australia.

Anticipating the danger of the introduction of the pest to New South Wales, a recommendation was last year addressed to the Minister for Agriculture that, in order to protect farmers here, cotton plants, lint, and seed be prohibited from entry into New South Wales unless the material had been adequately treated in a heating machine to destroy the boll-worm if present in any form.

At the interstate conference of entomologists held in Sydney in September last, too, motions were passed suggesting that a Commonwealth regulation be rigidly enforced to prevent the introduction from Western Australia, the Northern Territory or Queensland of any cotton, seeds, or parts of the cotton plant into other States until heating machines, fumigating plants or other adequate methods for destroying the pest have been established in the clean areas, and also that when an adequate quarantine has been arranged, an absolute record should still be kept of the particular districts in the three States mentioned from which cotton seed is obtained, and of its distribution in the States to which such seed is consigned.—W. B. GURNEY, Government Entomologist.

Co-operation for the Fruitgrower.

Points in the Formation of a Society.

W. MILLIGAN, Manager, Kentucky Soldiers' Settlement.*

The functions of a co-operative society of fruit-growers should be limited at the commencement of its career to the education of its members in the most up-to-date methods of production and harvesting, to the grading and packing of their produce, the purchase in bulk of necessary commodities, and the organisation of growers for the combat of pests and diseases on co-operative lines. Of these activities the last-mentioned is not the least important. By the adoption at the right time of pre-arranged measures on an extensive scale much can be done in the control of such destructive birds as parrots, parrakeets, miners, and starlings, of the various fungus diseases, and fruit fly, codlin moth, and other insect pests. Observations on the same lines by a body of growers in a district will, after discussion, lead to beneficial results by helping growers to determine the times best suited to the application of sprays and other preventive measures.

Finding Markets.

The attempt to control the marketing of the fruit is the rock on which many societies have been wrecked. A co-operative society of growers is at once a challenge to the commission agents, who in New South Wales have been engaged in the distribution of fruit for perhaps three-quarters of a century. As these people have spent large sums in establishing their businesses, it is to be expected that strong opposition will be given to any movement among growers along co-operative lines. At the same time much unwarranted criticism is levelled at commission agents operating in the city fruit exchanges. Owing to the disorganised state of the producing end of the fruit industry, the agents have proved a very important factor in the handling and selling of fruit, and must for some time govern the business of supply and distribution. There is no doubt that the small individual growers have benefited very largely, not only in selling, but also by the advice given by commission agents regarding supplies, prices, forecasting of supplies and market tendencies. The one great drawback to the commission agency business is that there is no check on handling charges and the prices received for fruit.

The distribution of the fruit by the local society during the first years must be done largely through accredited agents. As long as the established commission agent distributes the fruit uniformly throughout the season at a cost commensurate with the risk he takes, and as long as the account sales show an equitable sharing of the profits, this avenue of distribution will

* Extracted from a series of articles on "The Distribution of Fruit as it affects Orchardists on the Northern Tablelands."

prove the most economical to the society. For a society at the commencement of its business career to cater for single case lots to private consumers is disastrous, as the society is then competing with the retailer, without whom the industry could not survive under present day customs and usages.

Handling Costs.

The local society's function, at the business end, is to establish a system of handling that will reduce the first costs, and at the same time assure greater uniformity in the quality of fruit offered. Handling a large quantity of fruit allows of better handling equipment and better methods generally, while the waste and losses under the old methods are eliminated. In the course of a few seasons the society will show good results by higher prices and reduced handling costs. Handling costs may appear heavy the first couple of seasons, but often a very much increased output is possible with the same staff, and a staff going constantly at full capacity means lessened handling charges.

Set-backs to Co-operation.

A young society is often expected by contributors to show phenomenal results the first season. These expectations are largely fostered by the preliminary propaganda essential to the formation of a society. It is necessary, for example, to show the results obtained by established co-operative societies, and the impression made on many prospective members is one of high returns during the first season's operations. Some members join up without giving the question mature consideration beforehand, and when called upon at the end of the season perhaps to make a small monetary sacrifice in the way of a levy, pull out of the society.

Very often the grower outside the society, acting individually, gets the benefit of raised prices brought about by the society's efforts at organisation. Agents canvass the district and purposely offer and pay inflated prices for fruit delivered at the local railway station. Jealousy, envy, and selfishness often outweigh the honour, business integrity and sacrifices of the promotors, and to guard against this the manager and men engaged in the packing shed should be chosen from outside the society altogether. The business should be placed in the hands of the manager, the latter being responsible to the committee for the development and execution of the policy of the society. The objection raised to this is generally one of expense, but it may be overcome by making the share-money sufficiently high at the commencement to meet expenses until the packing shed gets properly going, when a handling charge should meet the cost.

Members of the society, or their servants, should be discouraged from loitering or remaining long in the packing shed at any time. lack of confidence in the manager or executive committee being thus prevented from springing up.

The Process of Formation.

Members of a newly-formed society should remember that co-operation cannot be forced upon the growers, but that all true co-operative movements have been born of dire necessity and (in the case of fruit-growers' associations)

an acute realisation of the fact that the difference between the price received by the grower and that paid by the consumer of the fruit in city shops is far too great.

The local co-operative society must start in a small way and grow as experience is gained, remembering that the success of the society depends upon the loyalty and enthusiasm of its members and the efficiency of the management. Membership of the society should be restricted to bona fide growers, the voting power of members being best based upon the amount of fruit put through the packing shed. Societies should be formed as non-profit-sharing societies, registered under the Friendly Societies Act of 1901. Under this form the society can set up rules and regulations sufficiently binding to hold members, yet simple enough for any member to understand fully. There are many societies operating under this Act, and a copy of the rules and regulations of any of them will prove a sufficient guide to compose a set to govern any society according to the desire of its members. In addition, every contributor should be required to sign a marketing agreement.

The work of a society should commence with the grading and packing of the fruit and its distribution over the local and city markets in quantities to suit requirements, and as arranged with the selected agents. The following system is simple and easily followed by any grower, and has been worked to the entire satisfaction of contributors.

The fruit is received from the grower and an interim receipt given for so many boxes. Each contributor's fruit is graded and packed separately, a receipt being issued showing the number of cases of each grade. Payment is made on this receipt. The fruit is dispatched to different markets, and all returns, together with freights, commission, and other charges, are pooled. The amount due to each supplier is reckoned on the net return per case in each grade. The pool is closed each week or fortnight as resolved, so as to get as near as possible to the average returns as shown in the market fluctuations. The supplier is handed a statement showing prices realised and deductions made, together with cheque for his net returns, within a couple of days from closing the pool.

By using empty kerosene cases, or other cases of uniform size, and provided the fruit is rough-graded when picking, the grower can keep a fairly accurate check on the tally shown on the produce docket issued after the fruit is graded and packed.

Purchases of commodities, excepting those used in the handling of the fruit, should be transacted on the basis of cash on delivery only. To ensure all contributors being treated equitably, a roster should be arranged at the beginning of the season and at later dates apportioning the number of cases that will be received and the days of delivery for each grower. By this means all contributors may share in each pool according to the extent of their crops.

Formation of an Association.

A spirit of rivalry naturally asserts itself between the members of a society, and if this rivalry is based upon common sense it proves of very great

benefit. In the same way, competition tends to become keen between individual societies, and vested interests are not slow in playing one society against the other. To avoid this it will be necessary to link the local societies into a district association. In bringing this about, each society should be allowed to preserve its local character, and the fruit of the society should be sold under the brand established and registered by that society. The enthusiasm and ambition of the contributors in each local society should be fostered, and assisted to develop along up-to-date lines. Initiative and originality should be encouraged to the utmost, and the reputation for its fruit that distinguishes it from other localities should be upheld.

Like the local societies, the association should start on modest lines. Unfortunately, societies are sometimes promoted by impractical enthusiasts with little business experience, only resulting in loss to growers, and a set-back to co-operative principles. To guard against disaster, only people of undoubted business integrity should be allowed to join up. Each local society should be represented on a basis resolved by a conference, while the articles of association should allow of the majority of control to be vested in the local societies. Large individual growers who are likely to remain outside the local society, provided they adhere to certain rules, should be eligible as members of the association, the weight of their reputation and experience being thus assured to the movement. The association should interest itself with the larger issues. Its functions will be to establish credit for fruit held by local societies, watch sales and movements of fruit in the larger centres, forecast the supplies available from other States, handle commodities in bulk and distribute them to local societies, arrange for freight, commissions, advertising and export if necessary, approach different governing bodies or other associations on questions affecting the industry in a particular locality or the district as a whole, and meet the organized demands of the workers, which must spring up as the industry establishes itself, by an organization as strong.

The above are a few of the tasks that are best handled by the district association, within the province of which also comes the appointment of a competent sales manager. The local society would find the cost of such an appointment prohibitive, and even if it did not the appointment would be undesirable, on account of the competition set up. The district association could act as an agent for a kindred association—a citrus-growers' association as agent for an apple and pear growers' association, say, and vice versa—or co-operate by allowing its salesman to offer the products of the other in conjunction with its own on a reciprocative basis.

And now let co-operation speak for itself. The following comprises information kindly supplied by the New South Wales Central Citrus Association, Ltd., and illustrates in a striking way what it is possible for co-operation to do:—

As an example of the growth of the individual sheds, we will, however, take the Gosford packing-house as an example, as it happens to be the oldest and now one of the largest sheds. This company started its operations three years ago, and was registered under the name of the Gosford Citrus Co-operative Society, under the Friendly Societies

Act. It commenced operations with twenty-six members. The total quantity of fruit packed by it during 1921 season was 7,000 cases, and its cost of handling, including cartage to railway station and a penny for contribution to capital expenses, amounted in total to 1s. 7½d. per bushel case. During the 1922 season its members increased to thirty-six in number; the total quantity of fruit packed was 12,000 cases, and the cost per case, including items before enumerated, amounted to 1s. 4½d. per case. During the 1923 season the company registered under the Companies Act, 1899, as a limited liability company, and is now known as the Gosford District Citrus Packing House, Ltd. In its third season (the one just concluded) its members increased in number to 123. The quantity of fruit packed was 45,000 cases, while the cost per case, calculated as in the two preceding instances, was reduced to 1s. 1½d. Of the 45,000 cases marketed during last season, over 17,000 cases were sold during the season direct to other States or to the country trade of New South Wales free from the intervention of agents, and therefore of commission. The saving in commission alone on this head was estimated on the high prices ruling in the vicinity of £950.

The increase in gross returns per case is generally reckoned at about 1s. 6d. per case, more being paid for the standardised pack and brand of a packing-house in comparison with similar fruit from a private grower.

Prunes and Plums on Various Stocks.

Experiments with plums and prunes on various stocks were continued at Yanco Experiment Farm during the season 1923–24. In the following table are indicated the results as affecting growth and crop; also the average height, spread, and diameter of trunk of the different varieties on the four stocks used, every care having been taken to select trees of even size. It should be noted that the Robe de Sergeant and Clairac Mammoth on peach stock having been "double worked," the development of the top is a year later than on the other stocks.

Variety.	Stock	Growth.	Crop	Height of Tree.		Spread.		Diameter of Trunk.
				ft.	in.	ft.	in	inches.
Angelina Burdett	Myrobolan	Fair ...	Good .	11	9	10	0	4¼
,,	Marianna...	Medium .	Very heavy	8	8	8	8	3¾
,,	Apricot ...	Very good	Good ..	12	8	10	0	4½
,,	Peach ...	Very good	Good ...	13	9	11	0	5⅜
Clairac Mammoth	Myrobolan	Fair ...	Good .	10	8	8	7	3½
,,	Marianna...	Fair ...	Good ...	10	4	8	1	3⅜
,,	Apricot ...	Good ..	Good ..	13	0	8	9	4¼
,,	Peach ...	Good ..	Good ...	11	3	9	0	4
President ...	Myrobolan	Medium . .	Very heavy	10	6	7	6	3⅛
,, ..	Marianna...	Poor . .	Very heavy	8	8	4	8	3
,, ..	Apricot ...	Good ...	Good ...	10	10	8	0	4⅛
,, ...	Peach ..	Good ...	Good ...	11	5	8	2	4⅜
Robe de Sergeant	Myrobolan	Fair ...	Good ...	9	8	5	10	3½
,,	Marianna..	Good ...	Good ..	11	6	9	4	4
,,	Apricot ...	Good .	Good ...	12	0	8	6	3¾
,,	Peach ...	Good ...	Good ...	11	8	7	9	4
Prune d'Agen ...	Myrobolan	Good ...	Good ...	11	9	8	9	4⅛
,, ...	Marianna...	Good ...	Good ...	13	6	8	1	4½
,, ...	Apricot ...	Very good	Good ...	13	8	9	5	4⅞
,, ...	Peach ...	Very good	Good ..	15	0	9	11	5

—W. J. Allen and W. W. Cooke.

Orchard Notes.

JUNE.

W. J. ALLEN and H. BROADFOOT.

WHERE deciduous fruit trees and vines are to be planted this season, it is preferable to start the work as soon as possible, provided the soil is in good condition. The early root growth, which starts long before the trees shoot in spring, then has an opportunity of doing so in the permanent position, whereas if planting be delayed the growth takes place in the nursery and is wasted when the tree is transplanted later. If the soil is very dry, however, it would be better to defer planting until after rain has fallen.

The ground should be well prepared, and sufficiently early for the soil to have time to "sweeten" by exposure to the influence of the sun and air before planting. The depth to which a tree is planted is important. Planting too deeply sometimes results in stunted growth, and even in loss of the tree. The tree should be planted at about the depth at which it was growing in the nursery.

Fruitgrowers are sometimes disposed to be too uncritical of young trees supplied by nurserymen. Each young tree received should be carefully inspected for any disease, and any that are spindly and poorly-developed, and apparently unlikely to develop into sturdy individuals. should be unhesitatingly rejected. No honest nurseryman, jealous of his reputation, would wish to foist such trees upon the fruitgrower. It is the careless and dishonest nurseryman against whom vigilance must be exercised. The grower has too much at stake to take avoidable risks.

Ploughing of existing orchards should be started this month, so that it may be completed by the middle of July.

Inter-pollination.

Pollination varies in effectiveness in different localities and under different conditions. Some flowers (usually very small and inconspicuous) are self-fertilised, and some are wind-fertilised, but generally speaking all plants which have conspicuous flowers are fertilised by insect agency, and in the great majority of cases nature prevents self-fertilisation, one of the preventives being that stamens and stigmata do not develop contemporaneously.

The need for cross-pollination has been more emphasised in the case of apples and pears, but it is also apparent in cherries, and in some varieties of both European and Japanese plums. The grower should take steps to assist cross-pollination. Deciduous trees of any kind should not be planted in blocks of the same variety, but suitable varieties of the same kind should be planted in alternate double rows. Any two varieties of the same kind will do, so

long as their flowering periods coincide or overlap. For instance, if Granny Smith and Jonathan are the apples to be planted, two rows of the former should alternate with two rows of the latter. The wise grower will naturally prefer varieties which, while suitable for cross-pollination purposes, are also valuable commercially.

Pruning.

Pruning will be occupying the attention of the orchardist this month. In the early stages of the tree's life-history the efforts of the pruner must be directed to shaping the tree. A good framework is the chief desideratum, and great care should therefore be exercised in choosing the best leaders for the future framework, the remaining leaders and other strong growths being removed. Early rather than late removal of undesirable wood is advised, as the wound caused by the removal of young growth heals much more rapidly than the wound caused by removal of older growth. For the first three or four years it is generally necessary, also, to top back the main leaders rather heavily, but when the lower part of the framework of the tree is sufficiently established (and while the tree is still making good growth) the leaders may be thinned out only and not topped back.

The characteristics of the various kinds and varieties of fruit-trees must be kept in mind. The pruner should remember that peaches crop only on the previous year's growth, and that the older wood will not retain a permanent self-replacing fruit spur like the apple and pear. In old apple and pear trees it is sometimes necessary to thin out fruit-bearing spurs, or they will become too crowded. The pruner should not only leave well-developed spurs for the next crop, but should leave partially formed spurs for later development.

Pests.

The bandages for codlin moth grubs should still be left on the trees, for (as pointed out in last month's notes) the grubs are inclined to leave less protected places as the weather becomes colder. The grubs so trapped can be destroyed by dipping the bandages in boiling water some time before the spring.

Apple trees infested with woolly aphis should be sprayed with tobacco wash. When spraying for this pest a good pressure is essential, and the nozzle should be held close to the limbs.

San José scale generally makes its first appearance on a few trees, and it is a good plan to give such trees prompt and special treatment. First prune the tree and burn the prunings, then give the tree a soaking spray with lime-sulphur or spray oil. If lime-sulphur is used, mix it somewhat stronger than the normal winter strength. Spraying in this manner uses a lot of spray on big trees, and if oil is used care must be taken to prevent saturation of the soil round the butt of the trees. To prevent this, first spray the butt, then throw in earth around it. Then, when spraying is completed, throw the earth out into the centre of the row.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Wentworth P. A. and I. Society	W. B. Crang	July 16, 17
Peak Hill P. and A. Society	T. Jackson	,, 29, 30
Condobolin P. & A. Society	J. Carter	Aug. 5, 6
Bogan Gate P. and A. Society	J. Egan	,, 12
Trundle P. and A. Society	W. A. Tolmie	,, 14, 15
Parkes P. A. and H. Association	L. S. Seaborn	,, 19, 20
Illabo P. A. and I Society	J. M. Hamilton	,, 20
Forbes P. A. & H. Association	W. T. Gilchrist	,, 25, 26, 27
Gunnedah P. A. and H. Association	M. C. Tweedie	,, 26, 27, 28
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	,, 26, 27, 28
Grenfell P. A. & H. Association	Geo. Cousins	Sept. 2, 3
Cootamundra A. P. H. & I. Association	W. W. Brunton	,, 2, 3
Manildra P. and A. Society	J. Longley	,, 9, 10
Culcairn P. A H. and I. Society	A. J. Ralph	,, 9, 10
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Northern A. Association (Singleton)	J. D. Guffils	,, 10, 11, 12
Ganmain A. & P. Association	A. R Lhuede	,, 16, 17
Cowra P. A. and H. Association	E Todhunter	,, 16, 17
Temora P. A. H. & I. Association	A. D. Ness	,, 16, 17, 18
Junee P. A. and I. Society	T. C. Humphrys	,, 23, 24
Canowindra P. A. and H. Association	J. T. Rue...	,, 23, 24
Murrumburrah P. A. and I. Association	W. Worner	,, 23, 24
West Wyalong P. A. H. and I. Association	T. A. Smith	,, 23, 24, 25
Barmedman A. and H. Society	T. P. Meagher	Oct. 1
Ardlethan A. Society	R. L. Neill	,, 1
Hay P. and A. Association	C. L. Lincolne	,, 1, 2
Corowa P. A. and H. Society	J. D. Fraser	,, 3, 4
Berrigan A. and H. Society	R. Wardrop	,, 7
Narandera P. & A. Association	W. H. Canton	,, 7, 8
Ariah Park A. Society	J. F. McInnes	,, 8
Deniliquin P. and A. Society	P. Fagan ...	,, 15
Griffith A. Society	M. E. Sellin	,, 15, 16
Lismore A. and I. Society	H. Pritchard	Nov. 18, 19, 20

1925.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 16, 17
Dapto A. and H. Society	E. G. Coghlan	,, 16, 17
Kiama A. Society	G. A. Somerville	,, 24, 26
Wollongong A. H. and I. Association	W. J. Cochrane	,, 29, 30, 31
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	Feb. 13, 14
Guyra P. and A. Association	P. N. Stevenson	,, 17, 18, 19
Newcastle A. H. and I. Association	E. J. Dann	,, 24 to 28
Blacktown A. Society	J. McMurtrie	,, 27, 28

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Agricultural Gazette of New South Wales.

An Agricultural Objective for New South Wales.

R. D. WATT, M.A., B.Sc., F.C.S., N.D.A. (Hons.), N.D.D., Professor of Agriculture, University of Sydney.*

THE title chosen for this address—"An Agricultural Objective for New South Wales"—is a somewhat daring and ambitious one, especially when one considers the snares and pitfalls invariably encountered by those who attempt to look into the future; but it does us good from time to time to take stock of our resources and make plans, even if these plans may not be altogether realised. Particularly desirable does it appear to be to consider the general agricultural position in New South Wales at the present juncture. Owing mainly to economic conditions over which they have no control, our farmers have been passing through a trying time. These conditions, combined with seasons that have been none too favourable, have resulted in the raising of the cost of production and marketing of agricultural products to a greater extent than the price of these products, thus reducing, or even obliterating, profits. At such crises there is naturally a good deal of depression and pessimism abroad, and an inclination on the part of tillers of the soil to turn their energies in other directions. As the Australian primary product for which there seems to be the most assured remunerative price is wool, there is a tendency to pay attention to an ancient fable that New South Wales is, and should remain, a pastoral or grazing State, and that it has no great agricultural future.

Some years ago I made the statement that the first century of Australia's occupation by a white race was an era of pastoral development, and that the second century would be equally notable as an agricultural era. In spite of the temporary set-back to agriculture in recent years I see no reason to alter that opinion. If I am wrong, the outlook for Australia—at any rate for a white Australia within the British Commonwealth of nations—is not very bright. The phrase "populate or perish" as applied to our conditions is no great exaggeration; and, together with any slogan for increased population, must go that of "speed the plough."

In seeking for an agricultural objective it is necessary, for the sake of concreteness, to take a specific period. What, then, may we hope to accomplish agriculturally in New South Wales in the next decade? I

* Notes from an address as Chairman of the Agricultural Section of the Royal Society of New South Wales, 12th May, 1924.

venture to suggest that we should aim at two things, which are somewhat intimately connected, namely,

(1) Doubling the present area under cultivation;

(2) Increasing the average yield per acre of our principal crops by 50 per cent.

Other subsidiary objectives, no less important, will appear as we proceed; but these two will perhaps be sufficient to form a basis for discussion.

To Double the Area under Crop.

Let us consider the first of our objectives—that we should aim at doubling the present area under crop in the next ten years. New South Wales has a total area of 198,000,000 acres. The area under crop for the last four years has averaged approximately 4½ million acres or about 2¼ per cent. of the total area. That this might be increased to 9,000,000 acres, or 4½ per cent. of our area, in the next ten years does not seem such a wild dream when we consider these facts:—

(*a*) In 1915 (our peak year), as the result of a splendid response on the part of our farmers to an appeal largely based on patriotism, we had approximately 5,800,000 acres under crop, or nearly 3 per cent of our area. Our objective therefore only represents an increase in acreage of a little more than 50 per cent. over that of 1915.

(*b*) Our acreage under crop did actually double itself in the eight years between 1908 and 1915.

(*c*) The percentage of the area under crop in our sister State, Victoria, which has been under the influence of the same economic factors and grows similar products, is about 8 per cent., and in 1915 was over 10 per cent. We are aiming at 4½ per cent.

(*d*) The area (83,000,000 acres) in New South Wales with a rainfall of over 20 inches is considerably larger than the United Kingdom, and the area (110,000,000 acres) with a rainfall of over 15 inches is more than one and a half times the size of Great Britain and Ireland.

(*e*) In the proved wheat belt of New South Wales—our main agricultural region, which is continually expanding—there is an area of 53,000,000 acres, which is almost as large as the whole State of Victoria.

Even if we make liberal allowances for unsuitable land, distance from railways, and other such factors, it will therefore be seen that if we do not double our acreage in the next ten years it will not be because we lack a sufficient area of land with suitable climatic conditions.

The factors enumerated are not, of course, the only ones affecting the position. There must, among other things, be sufficient inducement for the farmer to cultivate his land and grow crops. The question also arises:

What crops shall we grow on this proposed increased acreage? In this relation we might get some help from a consideration of the acreage devoted to our leading crops at the present time.

For the year 1921 (which was fairly typical) the relative areas were approximately as follows:—

	per cent.		per cent.
Wheat	72·0	Orchards and vineyards ...	2·0
Hay	17·0	Oats	1·6
Maize	3·3	Potatoes	0·6
Green forage	2·9	All other crops	1·0

These figures show the pre-eminent position occupied by the wheat crop (72 per cent.), which is further accentuated when we consider that the hay crop (17 per cent.) is largely made up of wheaten hay, although it also includes hay made from oats and lucerne. It is to the wheat crop, therefore, that we must largely look for this increase in acreage. Wheat is, indeed, the only purely agricultural product which we export on a large scale. That immediately brings us face to face with the crucial questions: Have we any indication that there will be a change for the better in the present economic conditions adversely affecting the wheat-grower in New South Wales? Have we any indication that the cost of production and marketing will decrease or the price of wheat increase?

There has already been a slight decline in several of the items of the former, and one would expect a continuance of that decline as world conditions gradually get back to normal. The cost of production per bushel depends largely on the seasons, and, although one hesitates to make predictions in this connection, one might perhaps be safe in saying that the weather conditions as a whole during the next ten years are not likely to be worse than during the last ten years. We all hope (not that hopes count for much) that they will be a great deal better. The cost of production per bushel is very greatly influenced by the average yield, and this will be considered later under the second objective.

With regard to prospective price, he would be a bold man who would predict more than a few months ahead, but the following considerations will help us to estimate the probabilities. Our wheat is grown partly for local consumption and partly for export, either as wheat or flour. Our last year's crop, which was an average one, amounted to 33,000,000 bushels, or enough to supply the world's requirements for about three days. Approximately half of that crop was required for local consumption and for seed, and the other half available for export. Now the world's price of wheat is governed by supply and demand, and even the price of locally-used wheat, unless prices are fixed by Government, is dependent on world factors. In other words, the price of wheat in Sydney is normally equivalent to London parity—that is, the price of wheat in England (the largest importing country) minus the cost of getting it there. Demand is governed mainly by two factors—increase in the bread-consuming population (roughly speaking, at present the white races), and the purchasing power of these peoples. Now the number of bread consumers is continually increasing and

likely to increase, especially as some of the more advanced among the yellow races are starting to take to the white man's bread. The purchasing power of the white races was seriously diminished by the war, many of the poorer people of Europe either doing with less food or adopting cheaper substitutes. As the European countries gradually recover from the war and its after-effects, one would naturally expect the world's demand for wheat to improve, although that may be balanced by increased production in countries like Russia.

As far as the world's supply is concerned, it seems at the present moment to be rather in excess of the demand, and there has been during the last few years a general tendency for prices to fall. History shows, however, that such a state of affairs has a tendency to right itself. When prices fall, countries like England and the United States, which have alternative crops to fall back upon, tend to diminish their wheat area until prices rise again or cost of production decreases. Such a withdrawal of land from wheat-growing does not so readily take place in a country like Australia, where there is not a wide choice of crops in the wheat-growing districts, and almost the only alternative is to allow the land to go back to pasture. English and American farmers declare that it is impossible to grow wheat profitably under present conditions, and there is a definite move deliberately to decrease the acreage under wheat in the United States, which is much the largest wheat-producing country. The wheat-growers in both these countries, as in several others, are suffering from a serious disadvantage as compared with their Australian competitors—namely, a greatly increased capital value, or rental, for their land, as a result of the years of high prices during, and immediately after, the war. This boom in land values did not affect us here owing to the difficulty in getting our grain to the world's markets. Whatever the position under pre-war conditions, it should be easier now for the Australian farmer to produce wheat at a profit than for the English or American farmer. Another factor in our favour is that it is always easier to find a market for the best quality of any product than for inferior grades, and, thanks largely to our climate and the work of our wheat-breeders, even f.a.q. Australian wheat ranks among the best in the markets of the world.

Wheat is being harvested somewhere every month in the year, and the delicate balance between supply and demand may be seriously affected at any time by so many influences—a rust epidemic in Canada, a drought in the Argentine or a political upheaval in Russia—that it is difficult to predict wheat prices with any certainty, so that the crucial question must be regarded as partly unanswered, with the balance of probabilities in favour of remunerative prices for Australian wheat. Even if there is no improvement in the economic conditions, the New South Wales farmer has always decreased cost of production per bushel to fall back on, and that is largely bound up in the second objective. In any case it is not wise for a farmer to rely on wheat alone, which brings us to a consideration of the other crops which might be grown on our proposed increased acreage.

The Question of Fodder Conservation.

Now, as compared with that of the agriculturists of most other countries, an exceedingly small percentage of the energy of the New South Wales farmer is devoted to providing food for his livestock at those times when the natural or artificial pastures cease to be sufficient for their requirements. In northern and central Europe, in Canada and the northern States of America that period of scarcity means the *winter months* (an average of perhaps six out of twelve). In Australia it means *time of drought and dry spells.* The main difference between the two issues is that the winters are very regular in their occurrence and duration, whereas our droughts and dry spells, though none the less certain, are apt to be more irregular in both respects. They have this much in common that in both cases, owing to climatic conditions, there is practically no natural vegetation growing to support the livestock. The farmer who has a winter to provide for does not feel satisfied unless he can look at his stack-yards and hay-sheds and silos in the autumn and say, "I have enough fodder in store to see my livestock through the winter with the help of some purchased concentrates." We read that in England somewhere about the 15th century "many animals died of starvation in the winter;" but it is quite an exceptional occurrence in the United Kingdom to-day to see animals even in poor condition, while death from starvation is unknown. Some day, it is to be hoped, our descendants in Australia will read, as an interesting historical fact, that at one time large numbers of sheep and cattle died of starvation during droughts.

In case one should be interpreted as casting an undeserved reflection on the Australian stockowner, let it be said that such complete provision for the wants of livestock during times of stress could not be expected here in the present state of our development. New South Wales is a large State with a sparse rural population, and in many respects is just evolving from the pioneering stage. At the same time it must be admitted that much more could be done at the present time and still more could be done in the future in the way of growing, purposely for the livestock, crops which could be either grazed, cut and fed in a green state, or conserved as grain, hay, or silage. The only crops which come under this category at present grown are hay (17 per cent.), maize (3·3 per cent.), green forage (2·9 per cent.) and oats (1·6 per cent.). With the exception of the green forage and a proportion of the remainder fed to working horses on the farm, the great bulk of these go to the towns and cities. When a drought comes, our stock of these commodities is always hopelessly inadequate.

What should we aim at doing in this direction during the next ten years? The following are suggested as objectives:—

On every mixed farm and on every sheep station in our agricultural regions we should have enough silage and hay stored to see the livestock through a drought of at least one year's duration, the supply to be replenished as soon after being used up as practicable.

On every dairy farm in the State we should have enough silage and hay stored to tide over a drought or dry spell equivalent to the worst on record for the district, the supply to be replenished as before.

It is realised that both of these are large orders, and the present state of affairs does not make one optimistic regarding their fulfilment. At the same time there is nothing in our soil and climatic conditions to constitute an obstacle—all that is needed is human energy and financial backing.

An Argument for Mixed Farming.

In the first place, there must be a far more general inclination to "mixed" farming—that is, to a dependence by the farmer for part of his revenue on livestock and their products, and not solely on crops sold off the farm. The wheat farm, for instance, however small, should always carry some sheep. This does not mean that the mixed farmer should do appreciably less cultivation, but crops specially grown for feed in the winter months, the fallow land in early summer (when grass seeds may be troublesome), and the stubble land in later summer and autumn should supplement the natural pasturage, which would normally be most abundant in the spring. With a sufficient reserve of silage and hay, such a farmer would be in a safe position whatever happened, and the function of the Rural Industries Board would almost disappear. The advantages of storing the food as silage (or ensilage as it is usually wrongly called) need not be elaborated, but there seems little doubt that if the simplicity and cheapness of making and filling a pit silo were only more generally known, the practice of ensilage would become much more common. On sheep stations of any considerable size in the agricultural belt the problem is a little more difficult, owing to the much larger number of stock to be fed, and the moving of some of the stock to more favoured districts will always remain a palliative. On some part of nearly every station in this region, there is a considerable area of land suitable for cropping, and, in these days of high wool prices, it would probably pay the grazier handsomely to have a team of horses and the necessary plant to grow and store hay and silage against a time of drought. If this is considered impracticable he still has the alternative of conserving natural growth in flush seasons or buying hay and grain from the farmer, and conserving the former in compressed bales and the latter in mouse-proof bins. Nearly all of these plans, if adopted, would mean a greatly increased area under cultivation, and any one of them would be preferable to facing the alternative of letting the stock die or paying famine prices for fodder in times of drought. Outside the agricultural regions, unless irrigation is possible, purchase of fodder from the farmer is the only reasonable proposition, and, as Dr. Elwood Mead pointed out, this would be an excellent outlet for much of the lucerne grown on our present and future irrigation settlements.

Then again, if the Australian dairy cow is to have her wants supplied, her owner must use the plough to a much greater extent than at present. If he finds that the situation can be met by growing a succession of fodder crops there should be no great need to conserve fodder as silage; but in

times of drought, though they may hold out longer than the pastures, the crops, too, may fail, and it is safer to have a reserve. Although some parts of our coastal districts are among the very best in the world from a dairying point of view, the average yield of milk and butter-fat is low in comparison with that of other countries, largely owing to the periods of semi-starvation through which the majority of the cows have to pass all too frequently. Because of the geniality of the climate and the abundance of succulent pasturage in good seasons insufficient preparation is made for dry spells. Some dairy-farmers have found it profitable to hand-feed their milking-cows whenever the pastures go off, and when a really dry time comes these men certainly score if they have a sufficient reserve to see them through. If it were the general practice, and more attention were paid to breeding for high production, the average yield of butter-fat per cow could be increased 50 per cent. in the next ten years—another subsidiary objective. The desired change may come about through the multiplication of herd-testing societies; for, if the records of the herds are published, the owners will see to it that their own particular herds are well looked after in the matter of feeding. It is rather a reflection on our average dairy cow that Melba XV of Darbalara gave in the eleventh month of her lactation period a greater quantity of butter-fat than the average cow does in a year. The average cow might quite reasonably reply that she was not allowed to chose her parents and that her owner is less generous as to her diet than the breeder of the champion mentioned, and less punctilious as to her general care.

This is a slight digression, but it all goes to emphasise the immense benefits that would accrue from a greatly increased acreage devoted to the growth of fodder crops to be fed to livestock direct, or conserved as hay or silage. In view of this, it is distinctly disappointing to find that the Government Statistician could collect information about only 24,000 tons of silage in 1921.

Possibilities of Expansion.

And now let us examine the possibilities of expansion in relation to other specific crops.

With regard to maize, very favourable soil and climatic conditions make our average yield of this crop high. As we have no export trade in this cereal and our growers are dependent on the local market, the price some years ago fell very low and the acreage consequently declined. There has been a slight revival in very recent years, which could surely be accelerated, as we have lately been importing large quantities—as much as 2¼ million bushels last year, or more than half as much as our average annual production. Oats, too, have been imported from other States during the last three years at an average rate of over 1,000,000 bushels per annum, some of which might have been produced in New South Wales. As to orchards and vineyards, if the increase in the area devoted to them continues at the present rate, they will almost perform their share of doubling the acreage in the next ten years.

It can now be taken as proved that cotton will grow successfully over considerable areas in New South Wales, and it would appear to be quite a profitable crop to grow for a number of years to come at least. Farmers in suitable districts should be still further encouraged to persevere with this crop as it would prove a very valuable addition to the all-too-limited number of our agricultural products suitable for export, and at the same time the by-product, cotton-cake, would be useful as a concentrated and nutritious food for livestock. Another valuable fibre crop is flax, which will grow quite well in some of our cooler, moist districts. Hopes were entertained that the high prices offered during war time might be the means of establishing the industry here. Since the war, however, prices have fallen too rapidly to leave us any great hope of doing so.

We have always grown a little malting barley, and when supplies from outside Australia were cut off during the war the opportunities for local production increased considerably. It was the South Australian and the Victorian farmer, however, who rose to the occasion, but there is no climatic or other reason why New South Wales should not have a greater share than she has at present in the supply of this commodity.

As we have in New South Wales many districts with soil and climatic conditions suitable for the growth of potatoes, it might be expected that our growers would aim at securing a greater proportion of the local trade than the 50 or 60 per cent. which they at present command. Climate, accessibility and soil are all factors which limit the area devoted to sugar-cane, but there would appear to be room for an increase on the twelve or thirteen thousand acres at present devoted to this remunerative crop, especially if certain diseases could be eliminated. The quality and price of locally-grown tobacco have greatly improved in recent years and, if we could get over the "blue-mould" trouble, there would seem to be an opportunity for a considerable increase in the area of this crop, which is so suitable to the small holder, as at present we only produce about 10 per cent. of the local consumption.

Finally, with a rapidly increasing population, there would appear to be room for a gradual increase in the area devoted to market-garden crops like tomatoes, beans and peas, pumpkins and melons, cabbages and cauliflowers, cucumbers, &c.

Owing to our great diversity of soil and climate an extremely wide range of crops can be grown in New South Wales. Many of them are not commercially profitable at the present time, but one never knows when a change in the economic position may be the means of adding quite a number of these to our present list. The gradual extension of our railway system, the provision of better roads and harbours, water conservation and irrigation, a progressive policy of closer settlement for our own people and our kinsman from overseas, greater attention to every phase of the marketing of our products and the granting of credit to primary producers generally, will all be important factors in doubling our acreage under crop in the next ten years.

To Increase the Yield per Acre.

In dealing with the second of the suggested objectives—the increase of the average yield per acre of our principal crops by 50 per cent.—attention will be confined entirely to the main crop, namely, wheat. Many of the statements and principles, however, might be applied equally well to others. At the outset it must be stated that our farming methods have improved greatly in the last ten years, and especially in the southern half of the wheat belt. This is reflected in the statistics, though not very clearly. If we take the average yields per ten-year periods since wheat-growing assumed considerable dimensions, we find that for the ten years 1892-1901 it was 10·02 bushels per acre, for the ten years 1902-1911 it was 11·04 bushels, and for the ten years 1912-1921 it was 11·64 bushels. There has thus been an increase of only a little over half a bushel per acre during the last decade over that of the previous ten years, and 1½ bushels per acre over the decade before that. The last decade up to 1921, however, had more than its fair share of adverse seasons; 1914 and 1919, taking the State as a whole, were probably the worst years from a wheat-grower's point of view on record—certainly quite as bad as 1902. The 1916 harvest was seriously affected by rust and storms, and 1918 and 1912 had rainfalls much below the average. Besides that, wheat-growing has been gradually extending into drier and drier districts, so that the improvement has been considerably greater than is indicated by statistics. There are indications that the rate of improvement has been accelerated very considerably in the last two years, in which there has been a greater increase in the amount of fallowed land and in the percentage of crop manured than at any previous time in our agricultural history.

That there is still a long way to go is shown in many ways. Our crop-growing competitions reveal the fact that the winning crops give a yield which is double or treble the average for the district. Any farmer will admit that there is great room for improvement, if not in his own system of farming, at least in that of some of his neighbours. It is true of New South Wales, as of most agricultural countries, that if every agriculturist were farming up to the level of the best the average yield would straight away go up at least 50 per cent. Mr. Watson, of Tichborne, a successful farmer, expressed the opinion at a conference at Parkes that the average yield per acre in his important district could be doubled if every farmer adopted improved methods.

Mr. A. E. V. Richardson, Agricultural Superintendent in Victoria, has devised a method of gauging the relative efficiency of the wheat-growers in the various agricultural divisions. He contends, and rightly so, that the greatest controlling factor in wheat-growing is the rainfall during the growth of the crop. The efficiency of a district or of an individual farmer is stated as the number of bushels of wheat per inch of seasonal rainfall. From the results of experiments carried out at Rutherglen, near the Murray, and therefore closely approximating to Riverina conditions, he concludes that for each inch of water transpired by the crop, an average yield of 3·54

bushels of grain could be procured. As the average seasonal rainfall for the wheat belt of Victoria is 11½ inches, the maximum possible average yield would be about 39 bushels. The efficiency of Victorian wheat-growers as a whole is shown by an average of 1·09 bushels of wheat for each inch of seasonal rainfall. In the Wimmera district, however, the average for the past decade has been 1·43 bushels of wheat per inch of seasonal rainfall, and for the past five years it has been 1 68 bushels. On the Longerenong Agricultural College farm an average of 3·5 bushels per inch of seasonal rain has been obtained during the last five years, and on two private farms in the Wimmera yields of 3·48 bushels and 3·6 bushels per inch of rain have been obtained during the same period. The wheat-growers of Victoria, as a whole, are thus obtaining much less than one-third of the maximum possible yield from the seasonal rainfall. The Wimmera district, where the greatest advances in cultural methods probably in Australia have been made in recent years, produces one-half this amount, and individual farmers in this progressive district are actually securing the full wheat yield possible on the rainfall. Mr. Richardson comments: "If the many could be encouraged to do what the few are already doing it is evident that the yield of wheat for Victoria, and probably the Riverina, could at least be doubled."

Returning to our problem in New South Wales. Our average yield over the past decade has been 11·6 bushels per acre. A 50-per cent. increase in yield would therefore mean 17 4 bushels per acre, an average which has only been exceeded in one year, namely, 1920. Our average rainfall during the growth of the crop over a series of years in the wheat belt must be at least 12 inches. Applying the foregoing criterion, it will be seen that our farmers over the last decade have obtained less than 1 bushel of wheat for each inch of seasonal rainfall. If their methods had been as efficient as those of all the Wimmera farmers, during the past decade the yield would have risen to a little over 17 bushels per acre, thus very closely approximating to the 50-per cent. increase we are aiming at. But the Wimmera methods have evidently improved most markedly during the last five years, and, if our farmers could come up to this standard of efficiency, our average yield would rise to over 20 bushels. If they could be raised to the standard of the best individual farmers, who obtain the maximum yields for the rainfall, the yield would be 42½ bushels per acre.

This method of reckoning has obvious limitations, but these considerations all serve to indicate that an increase in average yield of 50 per cent. in ten years is not beyond the bounds of possibility. It will be attained mainly by adopting more generally and more thoroughly the methods which are used by the most progressive and successful men to-day. In the Wimmera, with an average rainfall of about 19 inches, little wheat is grown on land that has not been fallowed, although oats are frequently grown on stubble land. Fallowing starts early—sometimes soon after harvest, and the fallowed land is frequently stirred by the harrow or cultivator so as to preserve a constant soil mulch right up to seeding time. The seed-bed is generally in perfect order; the varieties most suitable to the district have been definitely ascertained by careful experiment (Federation and Yandilla King are the

favourites); nothing but good seed is sown, and the best quantity per acre, as ascertained by trial, is used. It can generally be sown at approximately the best time for each variety; the optimum quantity of fertiliser (superphosphate) has also been definitely ascertained—it is much larger than is generally used in New South Wales—and every known precaution is taken to prevent disease. Earlier breaking of the fallowed land, the more frequent shallow cultivation of the fallow, and an increase in the quantity of seed and superphosphate have been the chief features of the recent advance. There is nothing new in this, and nothing very expensive, and where the climatic conditions are similar the same principles would apply to New South Wales, with these two reservations—that much of our land would not stand so much cultivation (up to fourteen times) as the grey-black Wimmera soil, and the quantity of seed required here is not so great, as we sow earlier.

Crop-growing competitions, with discussions among farmers as to the reasons for the excellence of the winning crops, have been a big feature in raising the general level of farming practice. The Australian wheat-farmers as a class are as receptive of new ideas as any body of producers, and, with the growth and increasing influence of the different agencies of the Department of Agriculture, of agricultural societies and similar organisations, and the agricultural element in the press, our second objective seems not such an impossibility after all. Farrer and other plant-breeders have given Australia a fine choice of varieties suitable to nearly every set of conditions; but there is no reason to assume that we will not have before the end of the next decade even better varieties—still more economical of water and more resistant to disease. Plant disease problems are being tackled in other ways by scientific men more thoroughly than ever before, and the result of their labours may have important effects on average yield before the ten years have elapsed.

Every increase in yield per acre generally decreases the cost of production per bushel quite appreciably, and from this direction, more than any other perhaps, may come the necessary stimulus and inspiration for a great agricultural advance.

These remarks, let it be said in conclusion, are perforce in the nature of generalities. There are individual farmers, it is realised, to whom recent seasons have brought little but bad luck. The plucky struggle of such farmers against nature's odds are appreciated to the full. May their experiences during the next few years compensate them handsomely for the game way in which they have stuck to their tasks!

THE Co-operation, Community Settlement and Credit Act passed by the New South Wales Parliament last session was modelled on every piece of legislation in operation in other parts of the world which could be availed of. We consider that in this State we have the most advanced legislation of this kind in the world to-day.—Hon. F. A. CHAFFEY, at the recent Interstate Conference of Ministers of Agriculture.

An Advantage of the Dry Pickling Process.

"As the wheat in some of my paddocks was coming up very patchy, I dug the enclosed sample up. The wheat had been in the ground about three weeks. I would be obliged if you would inform me what is the matter with it."

The writer of the foregoing was informed that the grain was affected by the mould fungus *Penicillium glaucum.* The presence of this mould is an indication that the seed has been injured prior to planting. Frequently the seed-coat is cracked slightly during the harvesting operations, and even though these cracks are not visible to the naked eye, they are of special significance because they permit the entrance of the copper-sulphate solution used in pickling. Although quite harmless on uninjured grain, the copper-sulphate frequently results in considerable injury on slightly cracked grain. The injury also is most marked when the soil conditions favour swelling of the grain without causing a good shoot. The copper-sulphate frequently is responsible for killing badly injured grain; it delays germination in other cases, and thus gives the mould fungi an opportunity to enter and complete the destruction of the grain.

Copper-carbonate dust, however, does not injure the grain at any time. On the other hand, there is evidence that the seedlings are actually stimulated by the treatment in the early stages of growth. The dust treatment effectively controls bunt, and because of its many other advantages is now strongly recommended for use instead of the wet bluestone pickle.—R. J. Noble, Principal Assistant Biologist.

Farmers' Organisation in Queensland.

Although the Australian agriculturist has a long way to go yet so far as organisation is concerned, there is, nevertheless, an increasing tendency among farmers to close up their ranks. Most significant, perhaps, among farmers' organisations is the Agricultural Bureau, which has done so much good work in South Australia and New South Wales. Another is the Queensland Council of Agriculture. Out of 40,000 farmers, said the Hon. W. N Gillies at the recent conference in Sydney of Australian Ministers of Agriculture, some 21,000 have joined up. This organisation, for which £35,000 was set apart during the last financial year, is the only organisation which the Government recognises as competent to speak on behalf of the farmers. There are nineteen district councils, the members of which are elected by the local producers' associations, and the district councils in turn elect the Council of Agriculture. The Council of Agriculture is really the farmers' parliament, which can, acting on the advice of the branches, ask the Government to pass certain legislation or to do whatever it considers necessary.

"Some of the things which it asks us to do we are not able to do," remarked the Minister, "but the Council is able to speak for the farmers, and I believe that if the other States followed our example we should be able to bring about such organisation as would secure to the farmer a reasonable price for his product. It has been urged that the farmers by organising will be able to exploit consumers by demanding exorbitant prices, but the farmers are intelligent enough to know that, after all, reasonable prices are the best for all concerned."

Fallow Competitions, 1923-24.

PARKES, FORBES, AND CORADGERY.

H. BARTLETT, Senior Agricultural Instructor.

PARKES PASTORAL, AGRICULTURAL, AND HORTICULTURAL ASSOCIATION.

THE effect of the first wheat crop competition promoted by the Parkes Pastoral, Agricultural, and Horticultural Association in 1922 upon the farming methods was so satisfactory that the Association in 1923 decided to extend its field of activities, and thereupon promoted a fallow competition for 1923–24. Ready support and a widespread adoption of the methods practised by the successful competitors has encouraged this Association to list an additional competition, viz., a fallow and crop competition, which will be determined by the highest aggregate points scored by a fallow judged in 1925, and a crop grown upon that fallow in 1925. The Association will conduct three field competitions in 1925, the total prize money being £39. Such activities bring home to farmers the usefulness of the Association and increase their interest in its success.

In the field competitions in the Parkes district each competitor sets himself the task of winning twelve months before the judging. This results in a keen contest between excellent exhibits, all worthy of a prize.

The 1923–24 fallow competition was judged in the latter end of March, 1924, after a period of five weeks without rain. Ten entries, each not less than 50 acres in one area, were placed before the judge, and were judged under the scale of points shown in the accompanying table.

DETAILS of Awards.

Competitor.	Moisture.	Mulch.	Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points ...	30	30	30	30	30	150
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
1. H. K. Nook, "Nelungaloo" ...	23	29	30	27	27	135
2 R. M. Kelly, "Wirrocara" ...	25	24	29	28	27	133
3 A. Mill, "Durran," No 1 ...	26	23	29	25	25	128
4 J. Aitken, "Harrowvale" ...	22	23	29	25	24	123
5 W. A. Woods, "Rosedale" ...	20	24	29	25	23	121
6. T. B. Ellis, "Happy Valley" ...	26	18	29	20	27	120
7. W. W. Watson, "Woodbine" ...	15	22	29	23	22	111
8. A. Mill, "Durran," No. 2 ...	21	20	29	20	20	110
9. J. T. Nash, "Cavanbar" ...	15	20	28	20	25	108
10. C. A. Johnson, "Wongalea" ...	21	19	24	18	20	102

RAINFALL Table.

	Parkes Post Office.	W. W. Watson.	H. K. Nock.	C. A. Johnson.	W. A. Woods.
1923.	Pts.	Pts.	Pts.	Pts.	Pts.
June...	466	349	320	339	387
July	346	187	202	217	213
August	92	46	112	80	67
September	133	184	65	106	51
October	245	132	115	118	182
November	254	80	86	174	132
December	83	49	20	104	40
1924.					
January	70	50	51	58	55
February	307	232	256	109	207
March	Nil.	10	14	3	Nil.
	19·96	13·19	12·41	13·08	13·34

The Season.

The rainfall during the fallowing period varied considerably in incidence within the area covered by the competition, though the aggregate points are more nearly equal for each centre, with the exception of Parkes Post Office. Good rains fell in June and July, 1923, and fallows were broken in ideal conditions. Favourable rains for working were delayed till the end of October, when most of the competitors seized the opportunity of putting the fallows in order in view of the summer. The rainfall was then patchy and light till the middle of February, when storms made it possible to place the seed-beds in order.

Comments.

From the standard of the fallows exhibited, it is evident that farmers have not only been studying the factors that make for ideal seed-beds, but they have put the knowledge gained into practice. There is little call for the judge to explain consolidation, mulch, capillarity, nitrification and such terms; soil physics is evidently becoming a pleasant and profitable subject to the grower of wheat. The elementary stages are now passed, and each farmer or group of farmers is engaged in the determination of the workings most suited to his or their type of soil.

The competition has brought to light the necessity of varying the cultivations to suit different soils, in illustration of which it might be mentioned that the winning fallow, produced by Mr. Nock, was not ploughed. Other soil will not stand frequent workings, and even then it is advisable to use tine implements; but this subject will later be discussed in detail.

Generally speaking, the fallows were of a high standard, and the first three fallows especially so. It was somewhat difficult to place the fallows exhibited by Messrs. Nock and Mill, as the soil is of the heavy, self-mulching, myall type, which cracks when dry, and when ploughed is almost impossible of

consolidation during the fallow period. Neither of the fallows were ploughed; they were therefore judged in comparison with an ideal fallow for this type of soil.

Moisture content was surprisingly good throughout, most of the subsoils being plastic. This was in direct contrast to stubble land, which was frequently tested for comparison. It was a pleasing necessity in many cases to have to ask as to the placement of corners and finishes; such a condition assists even sowing and even crops.

The place in the award table occupied by the fallow exhibited by Mr. C. A. Johnson is decidedly disappointing. The land had been fallowed for two years, ploughed twice, plus seven additional workings. Unfortunately, wild melons made discing deeply in January a necessity, and a ridged surface was produced which a harrowing in February did not eliminate. The result was a loose, uneven seed-bed that is particularly undesirable in this self-mulching type of soil, being difficult to consolidate. Perhaps, given a favourable germination period, Mr. Johnson will produce the crop which will more than compensate for the disappointing award.

The Winning Fallows.

Mr. Nock exhibited a fallow which was difficult to fault. The soil is a clayey loam and self-mulching, *i.e.*, upon drying the surface does not set, but crumbles. The previous crop was wheat, 1922, the stubble of which was grazed. The land was disc-cultivated in July, harrowed in September, springtooth-cultivated in October, and springtooth-harrowed early in February. To a depth of 9 inches the moisture was light, but the subsoil was almost saturated. The mulch was of exceptionally good texture for this type of soil and 2 inches in depth. Weeds were entirely absent, and all cultivations had been carefully done to a uniform depth.

Second position was awarded to the area exhibited by Mr. R. M. Kelly, who is a keen agriculturist with sound technical knowledge, who is assisting to introduce methods that may be of considerable moment to the farmers of the district. The recognised safe methods were not departed from. The previous crop was wheat in 1922, the stubble of which was grazed and burnt. The area was of summer fallow and was springtooth-cultivated in April, 1923, mouldboard-ploughed in July 4 inches deep, harrowed in August, springtooth-cultivated 4 inches deep in August to bring the clods to the surface, cross-springtooth-cultivated in October 2½ inches deep, lightly worked with cultivator-harrow in November after rain, and again in February after rain.

The soil is a deep red loam, there being no marked change in character to a depth of 2 feet. The moisture content was very good from the mulch downwards. The mulch was somewhat fine, but as this soil does not appear to set hard after rain, the fineness was not perhaps of any great moment. Consolidation was exceptionally good in texture and depth. Cultivations had been carefully done, the finishes not being noticeable.

Mr. A. Mill's fallow occupied third position. The soil is a chocolate to black clayey loam, of the self-mulching type, somewhat heavier than Mr. Nock's. The last crop was wheat in 1922, the stubble of which was grazed. The fallow was not ploughed; it was springtooth-cultivated in June, 1923, and again in August and in October; harrowed in the middle of February and scarified in the latter end of February. A small portion of the area received different treatment; it was ploughed in August, scarified in October, in the middle of February, and again in the latter part of February.

It is interesting to note the difference in these two areas. With the former the mulch was of the correct texture and depth to suit this soil. An absence of clods underneath the mulch eliminated air pockets, and the moisture content was good directly underneath the mulch. With the latter the mulch was deep, underneath which the condition was somewhat cloddy, and rather dry to a depth of 5 inches. This small area somewhat depreciated the value of the block, which had to be judged as a whole, but it will be interesting to observe the growth of the crop in the present season.

FORBES P., A., AND H. ASSOCIATION.

The field activities of the Forbes Pastoral, Agricultural, and Horticultural Association are becoming the most interesting and most important sections of its work, and they are helping decidedly towards the success of farmers of the district. Commencing with a wheat crop competition in 1921 and a fallow competition in 1922–23, the good work has been continued to date with gratifying results.

The value of pure seed wheat has been fully grasped, and latterly the demand has exceeded the supply. The competitions have brought to light, also, interesting factors in the control of diseases, notably take-all and foot-rot, and it is perhaps not out of place to draw attention to results obtained by Mr. Ash, a Forbes farmer, who by a rotation of oats, fallow, and wheat last year (1923) harvested eleven bags per acre from an area of 50 acres that in past years had failed to grow a "crop" owing to the ravages of take-all and foot-rot. This year, eleven farmers in sight of Mr. Ash's property are growing oats.

The working of the fallows has improved, and many growers have expressed the intention of growing wheat only on fallowed land. The use of superphosphate is becoming general, and there has been an elimination of the least useful varieties of wheat. The Association can justly be credited with directing attention to these features of modern agriculture in the district, and the growing success of their annual exhibitions may largely be attributed to their activities in this direction. The Association is also controlling a number of experiments under the supervision of the Department

of Agriculture, which, it is hoped, will in the near future render even more assistance to wheat-growers.

The fallow competition was judged the latter end of March, 1924. Eleven entries were received, each of not less than 50 acres in one area, and they were judged under the scale of points shown in the table of awards.

DETAILS of Awards.

Competitor.	Moisture.	Mulch.	Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points ...	30	30	30	30	30	150
	Pts	Pts.	Pts.	Pts.	Pts.	Pts.
1. T. R. Sharp, "Aberfoyle" ...	26	27	28	26	26	133
2. T. R. Jones, "Birdwood" ...	22	25	28	26	27	128
3. P. Cannon, "Silver Row" ...	24	23	29	24	25	125
4 H. Green, "Kiora"	22	20	28	23	27	120
5. H. G. Mattiske, "Sunnydale" ...	22	20	28	22	25	117
5. M. R. Kirkman, "Calare" ...	21	21	29	20	26	117
7. M. W. Clemens, "Glenisla" ...	20	22	29	20	23	114
8. B. J. Kupkee, "Greenwood" ...	15	20	28	26	23	112
9 G. Somerville, "Okawa" ...	20	18	27	20	23	108
10 G. F. Sanderson, "Wowingragong"	18	17	28	20	23	106
11. J. W. Rees, "Evergreen" ...	20	17	26	22	20	105

The Season.

The rainfall registration at Forbes during the fallow period was :—June, 1923, 386 points; July, 251; August, 81; September, 246; October, 140; November, 97; December, 98; January, 1924, 80; February, 211; March, 73 points.

Useful rains fell during June and July, enabling the fallows to be ploughed in good condition. September and October presented an opportunity of placing the fallows in order for the summer, and rather dry conditions followed till the middle of February, when useful storms were registered over most of the district.

Comments.

Taken as a whole, the fallows were satisfactory and were quite in keeping with the progress made in past years. Where soils differ widely in texture, as in the Forbes district, it is necessary to modify the methods of working the fallows, and several farmers did so with gratifying results. In a number of cases the mistake was made of having too deep a mulch—in some instances caused by the light rainfall not consolidating the sub-surface soil, but often due to the workings being too deep, and especially to the use of the disc cultivator in February and March. Unfortunately, where melons are troublesome, the use of the disc-cultivator is often necessary, but it is wise to use this instrument as rarely as possible on the fallows. Two competitors erred

on the side of too shallow a mulch, the effect being insufficient protection, allowing evaporation, and insufficient covering of the seed. A mulch of 2 to 2½ inches is most satisfactory.

The greatest amount of moisture was contained in those fallows that had been worked immediately after useful rain. The fact is again illustrated that it is not the frequency of workings that is most important, but rather the condition of the soil when worked.

The Winning Fallows.

Mr. T. R. Sharp, of "Aberfoyle," exhibited the best all-round fallow. The soil is a red to clayey loam 6 inches deep, overlying a retentive subsoil. The previous crop was wheat, 1922, the stubble of which was grazed and then burnt. The area was disc-ploughed early in October, 1923, harrowed early in November after 80 points of rain, harrowed in January after 110 points of rain, and springtooth-cultivated in February after 2 inches of rain. To a depth of 4 inches the moisture content was light, but from 4 inches to a depth of 2 feet the subsoil was almost saturated. The mulch was of a very good texture, correct depth and even. Consolidation was good. Although the ploughing had been 5 inches deep, the corners and finishes were hardly noticeable, indicating efficient handling of the implements.

Second position was filled by the fallow exhibited by Mr. T. R. Jones, of "Birdwood," who has been a constant competitor in all competitions, and who has been allotted the pure seed wheat areas by the Association. This year the Forbes farmers will have pure seed supplies available in their district. The soil is a red to sandy loam, 9 to 12 inches in depth. The last crop was wheat in 1922, the stubble of which was grazed. The area was summer-fallowed, being disced in April, 1923, disc-ploughed in September to a depth of 4 inches, harrowed in October and in November, springtooth-cultivated in March, and harrowed in March. The moisture was satisfactory and at a depth of 2 feet the subsoil was plastic. The mulch was generally of a nice depth, but a little deep in certain reddish patches. Consolidation was good, and all cultivations had been very carefully done.

The fallow exhibited by Mr. P. Cannon, of "Silver Row," which was third in the award table, places before us perhaps a better object lesson than any other fallow in the competition. The land was mouldboard-ploughed in July-August, 1923, to a depth of 4½ inches, springtooth-cultivated early in November, and again towards the end of February. Such a few workings almost indicate a "fluke" fallow, but a study of the rainfall records, times of working, and the nature of the soil, indicates that the fallow was handled in an intelligent fashion. The land is situated at Tichborne, and could be termed a loam to sandy loam, but it is more of a silty nature and runs together after rain. With this class of soil care must be taken to maintain a fairly cloddy mulch, and frequent workings, especially when dry, would have a pulverising effect, with resultant setting and caking after rain. This brings to mind Mr. Green's fallow, which was probably worked rather too frequently.

as instanced by a harrowing given in January. It is not contended that two workings will always give the best fallow with this soil; in some years, with good rainfalls, four workings may be necessary.

CORADGERY AGRICULTURAL BUREAU.

Coradgery is situated in the eastern portion of the Central-western Plains, equidistant from Parkes, Trundle and Peak Hill. The chief timbers are the many kinds of box, cypress pine, kurrajong, myall and wilga, and though large areas of these have disappeared with the advent of closer settlement, they nevertheless denote a diversity of soil types admirably adapted for grazing and wheat-growing. The country is undulating to flat, and stony outcrops, surrounded by the lighter types of red loam soils, gradually merge into the heavier darker soils, typical of the plain country. If anything, the loams to clayey loams predominate, and in places the heavier, chocolate to black, self-mulching soils so common to myall country are to be found.

The average rainfall is approximately 19 inches per annum, the precipitation tending to favour the summer period. The country, once wholly devoted to grazing, has felt the influence of closer settlement, and areas now range from 900 to 1,500 acres, the size being ideal for mixed farming—sheep and wheat. In this centre, as in many others where wheat-growing has partly displaced grazing, the tendency at first was to extensive rather than intensive wheat-growing, and although failing crops are useful for grazing purposes, experience here as elsewhere has proved them unprofitable. A wheat crop must return 12 bushels per acre to pay expenses, and the statement that a 30-bushel crop from 200 acres is more profitable than 20 bushels from 400 acres is worthy of consideration.

Coradgery is fortunate in having an active branch of the Agricultural Bureau. In past years this branch has conducted pure seed wheat competitions, and it has the honour of having promoted the first field competition in the western district. With the object of bringing members of the branch into closer touch with progressive methods of agriculture, a fallow competition was promoted last winter and judged in March, 1924. This is to be followed by a crop competition, which will be judged next November (1924). Many farmers, too distant from the towns of Parkes, Peak Hill or Trundle to feel the influence of the agricultural associations in the field sections of their work, are being catered for by the Bureau; this activity will undoubtedly strengthen the branch. Steps will be taken to secure affiliation with the western district agricultural associations, thereby making it possible for the winning crop of the crop competition to be eligible to compete in the championship crop competition for the western district, which is again being promoted by the Royal Agricultural Society for 1924 crops.

Eleven entries were submitted to the judge, each entry being of not less than 50 acres in one area, and they were judged under the scale of points shown in the table of awards.

DETAILS of Awards.

Competitor.	Moisture.	Mulch.	Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points ...	**30**	**30**	**30**	**30**	**30**	**150**
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
1. I. Tanswell, "Cleveden"	18	25	24	25	26	118
2. Riley Bros., "Bardun," No. 2 ...	15	25	28	25	24	117
3. Goodyear and Jenkin, "Adavale"	20	23	26	23	22	114
4. Riley Bros., "Bardun," No. 1 ...	18	24	29	22	20	113
5. A. Millgate, "Rockvale" ...	20	23	26	23	20	112
6. W. E. Tayler, "Adavale," No. 2...	22	20	25	20	20	107
7. W. J. Brown, "Mascott" ...	18	23	26	15	18	100
7. L. G. Ward, "Hopetoun" ...	18	18	27	15	22	100
9. W. A. Woods, "Rosedale" ...	15	18	28	15	22	98
10. T. Tanswell, "Fernleigh" ...	18	15	28	15	17	93
11. W. E. Tayler, "Adavale," No. 1...	13	18	24	17	18	90

RAINFALL Table.

	W. E. Tayler, "Adavale."	A. Millgate, "Rockvale."	I. Tanswell, "Cleveden."
1923.	Pts.	Pts.	Pts.
June	398	424	...
July	235	258	...
August...	50	104	67
September	44	47	51
October	186	213	182
November	105	148	132
December	56	214	5
1924.			
January	36	59	Nil.
February	169	130	90
March	13	5	Nil.

The Season.

The season was not a favourable one for producing high-standard fallows, and this was reflected in the low moisture content of the subsoils and lack of consolidation of the sub-surface soil. The carry-over moisture from the 1922 season being negligible, the fallows were wholly dependent for moisture upon the rainfall from date of ploughing. June and July, 1923, were favourable months for ploughing, but a dry period followed till the end of October, when storms precipitated 2 inches, which, though of inestimable benefit to the grain crops, came too late in many cases to allow of the working of fallows owing to the urgency of hay-making operations. Dry conditions again ruled until the middle of February, when storms yielding up to 1½ inches of rain presented a favourable opportunity to improve the fallows in consolidation and cleaniness.

Comments.

The impression gained by the inspection of all the areas was that a continuation of the competitions will tend to improve the preparation of the seed-beds. The standard of the fallows in the adjoining districts of Parkes and Forbes, where field competitions are now in their fourth year, is a direct encouragement to the Bureau, and it is anticipated that next year several of the faulty factors will be eliminated.

With the exception of two areas, insufficient care had been taken when preparing and working the land, *e.g.*, the ploughing depth varied, finishes and corners were noticeable and only lightly covered with mulch, and the cultivators had not been altered to suit varying soils. Concave finishes and corners are best avoided by splitting and then gathering the land for at least eight furrows on either side when ploughing, decreasing the depth of ploughing towards the completion. With concave finishes, seed cannot be effectively covered, nor is the depth of sweetened soil available, and the result is shorter growth and decreased yield.

Where fallows had lately been worked with disc implements the mulches were too deep and the consolidated portion too shallow. Unfortunately the growth of wild melons compelled the use of the disc implements in a few cases, and though there is no better implement for the melons, it is wise to avoid using the disc-cultivator on fallows if possible, owing to their depth of working and pulverising effect on the surface soil. Consolidation was lacking generally, no doubt owing to the dry conditions and the absence of suitable conditions for working the land.

The Leading Fallows.

Mr. I. Tanswell exhibited the best fallow, the soil being red to clayey loam, with patches typical of myall country. The soil was from 9 to 15 inches in depth, overlying a retentive clayey subsoil. The moisture content to a depth of 2 feet was greatest on the heavier soils. Owing to the patches of self-mulching myall soils, where it is difficult to keep the implements from cultivating too deeply, the mulch was somewhat uneven, and this also affected the consolidation. All cultivations had been exceptionally well done; finishes were not noticeable. The area was mouldboard-ploughed in August, 1923, springtooth-cultivated early in October, again early in December, and again in February.

Messrs. Riley Bros. exhibited two areas, which were placed second and fourth. The better fallow was produced on loam to clayey loam soil, which was 9 inches to 2 feet in depth. The previous crop was wheat in 1922, the stubble of which had been grazed. The area was mouldboard-ploughed in July, 1923, springtooth-cultivated in October, disc-cultivated in January owing to a growth of melons, and harrowed in February. The moisture content was rather low; the mulch was of good texture and depth, and consolidation was fairly satisfactory; finishes and corners hardly noticeable, indicating careful cultivation.

The other area was of summer fallow, and had been springtooth-cultivated in March, 1923, mouldboard-ploughed early in June, disc-cultivated in October and again in January, and harrowed in February. The soil was of red loam, being 12 inches in depth. The ploughing of this area was rather shallow and uneven, with a consequent unevenness in consolidation. The mulch was slightly uneven but of good texture. Moisture content was better than the previous one, no doubt owing to the early cultivation in March, 1923.

Third position was occupied by Messrs. Goodyear and Jenkin, share-farmers on "Adavale." The soil is a red loam with a depth of 9 inches, overlying a clayey subsoil, which below a depth of 20 inches becomes freer in texture. The land was mouldboard-ploughed in July, springtooth-cultivated in December and again in February. The moisture content was satisfactory considering the season; mulch and consolidation somewhat uneven. A little more care when working the land would have greatly improved this fallow.

Payment for Quality in Wheat.

Within the last ten or fifteen years the technical equipment of the best mills has very greatly improved. Millers can now make better use of the wheats' potentialities and have overcome the objection which their predecessors had to certain varieties. While it is true that certain varieties of wheat are of greater value to the miller than others, it is equally true that the miller in the past—whatever he may do in the future—has not paid the farmer a sufficiently increased price per bushel for such particularly desirable wheat (which may have given the farmer an indifferent yield) when compared with the price he offers for a less desirable variety (but which may have given a much higher yield to the farmer). Under the present f. a. q. system, while the farmer who has inferior wheat is penalised by a system of dockages, the farmer who has wheat of superior quality obtains no more for it than the farmer who has wheat of average quality. The only practicable means of ensuring that farmers really receive a price in accordance with the quality of the wheat is by the general institution of a scheme of selling wheat on grades.—A. A. Ramsay, Chemist.

An Agricultural Society's "Journal."

The "Journal of the Bath and West and Southern Counties Society," a volume of 450 pages, reaches us. The society exists "for the encouragement of agriculture, arts, manufactures, and commerce." The Journal presents a short account of the transactions of the year 1923–24, and similar information, but to the general reader the chief interest will lie in the fifteen articles that occupy the first 250 pages of the book. These touch a great variety of subjects, such as forestry policy, the characters of the Milking Shorthorn, the insect pests of cruciferous crops, agricultural education, animal parasites, and so forth. A very comprehensive report on the work of the National Fruit and Cider Institute is a feature of some interest.

Our copy comes from the Society. The publishers are Edward Stanford, Limited, London.

Purity of Seed Oats.

J. T. PRIDHAM, Plant Breeder.

It is sometimes said by farmers that Algerian oats grown continuously without selection will revert to wild oats. While this statement cannot exactly be endorsed, it may nevertheless be said to contain a good deal of truth.

Carleton, in "The Small Grains," says:—"Red Texas oats tends to run out after two years' growing in Kansas, giving place to a black variety, the seed of which always appears in a sample of the red sort imported from Texas. In the latter state the black-seeded plants are present, but do not supplant the red sort as in Kansas."

N. W. Jackson, in Extension Bulletin No. 30, Canada, says:—"Cultivated oats escaped from cultivation show all grades of variation between wild and cultivated oats. We find these grades in some cases weighing 34 lb. per bushel with chaff devoid of hairs. Wild oats run from 18 to 27 lb. per bushel."

Garber and Quisenberry, in *Journal of Heredity*, September, 1923, remark that: "False wild oats are hairy and glabrous in their seed-coats; some like *A. fatua* and others smooth in some cases. The false wild are very similar to *A. fatua*, but the seed of the latter is delayed in germination because of its heavy seed-coat which seems to prevent oxygen reaching the germinating embryo. This character is seen also in the progeny of wild cultivated oats, but false wild oats do not show delayed germination."

N. Criddle, in Ottawa Nat. 23, 1907, No. 7, refers to "White wild oats which resemble in colour, shape, and size the variety from which they originated and in other respects the wild species, except that the basal hairs are absent or nearly so. Specimens of these white wild oats were found in Banner, Newmarket, Abundance, Storm King and Bumper King."

At Cowra Experiment Farm this season we have found in Mulga oats black-hulled seeds enclosed in an outer white husk. The black seeds were slightly hairy and had the horse-shoe attachment characteristic of the wild oat. We have found Sunrise and its derivatives (Mulga is one), to be more troublesome to keep pure than other varieties. Readers may recollect that Sunrise originated as a sport in Algerian oats, and has a large smooth, white or greyish-white grain. After sowing it for two or three seasons, however, we find 1 or more per cent. of black seeds and a varying proportion of off-colour seeds from white to a decided brown tint. This state of things is most disconcerting to a farmer who wishes to grow pure seed for sale. In other varieties we have seen a little variation—mostly in colour of seed-coat—but not nearly to the same extent as in the Sunrise type.

In 1922 a field crop of Fulghum oats was noticed to show unevenness in heading, and on closer inspection such differences were seen in the plants that 172 single-ear selections were made. The seed which produced this crop

came originally from America and had not been selected in this country. "Fulghum oats originated about 1897 on a Mr. Fulghum's farm in Georgia. It was an individual plant in a crop of Red Rustproof, 10 to 12 inches taller and much earlier. It appeared to be the result of a natural cross. Subsequent sowings from the plant came true, and now it is largely grown in many States of U.S., America." This history, taken from U.S. Department Circular No. 193, closely resembles that of our Sunrise oats. The ear-to-row selections from Fulghum were grown at Cowra last year, and some bred true, while others showed considerable variation, suggesting the effect of natural crossing. The variations from type presented shades of colour from creamy white to black, including browns, greys and yellows. Some seeds were smooth and others more or less hairy. Fulghum oats have a dun-brown colour; the seed is of medium length and smooth. The most productive types of these selections were sown again this year for further study. It looks as if the new climatic and soil conditions have disturbed the equilibrium of the variety and that natural crossing had occurred. The case of Federation wheat is a similar instance; the variety had been grown pure for some years at Cowra, but when taken to Longerenong, Victoria, to different conditions, it began to vary. Continuous selection, however, has kept the wheat pure, and it is grown there to-day as largely as ever.

In the same way with oats, provided that care is taken to continue selection, varieties can be kept sufficiently pure for all practical purposes. It will be necessary to use stud seed in small quantities every year, growing increase plots to supply seed for larger areas. This stud seed could be obtained from an experiment farm, though it cannot be guaranteed that it will be quite free from variation. An effort is being made to isolate a pure fixed strain of Sunrise and Mulga, but even if such is obtained continuous selection is necessary to provide against natural crossing which might occur; besides, the process will also keep up the productive powers of the variety. The attention of *Gazette* readers has already been directed to methods of selection for wheat, and exactly the same procedure should be followed with oats.

The foregoing remarks do not include temporary variations that have resulted from external influences. For instance, a variety commonly shows a much paler colour of seed-coat in a warm climate than in a cold. Algerian grown at Cowra are pale brown, while the same variety raised at Glen Innes will be quite dark-brown in colour.

REGARDED as a fertiliser, fresh poultry manure is richer in nitrogen than it is in phosphates and potash. It contains about two-and-a-half times as much nitrogen and phosphate as an equal weight of farmyard manure, but only about the same amount of potash. The bulk of the nitrogen is present in an easily fermentable form. The manure is therefore quick acting, and care must be taken in storage or much of the valuable ammonia will be lost.—*Journal of the Ministry of Agriculture, London.*

Farm Planning.

A. H. E. McDONALD, Chief Inspector of Agriculture.*

Unlike most others who have commodities to sell, whether of labour or of goods, the farmer is unable to fix his selling price. This applies particularly to staple products for which there is a world demand, such as wheat, butter, wool, &c. In selling these, he has to compete with farmers throughout the world, while in his own home markets he is faced with the powerful organised opposition of consumers who object to paying prices in excess of those ruling in the world markets.

This inability to fix prices leaves the farmer without a single really powerful weapon by which he might secure a profitable return upon his operations. His main hope, therefore, is that by adopting farming practices suited to the particular conditions of soil, climate, and locality in which he is situated, he will be able to produce at a cost which will leave some profit. Successful farming therefore resolves itself into a question of reducing the cost of production to the lowest possible point.

The Means to be adopted to Reduce Costs.

The means which may be adopted are varied. They include the choice of the main activity on the farm, such as whether it will be wheat or maize growing, whether sheep or dairy cows will be kept, or what combination of these may be adopted, and the defining of the magnitude of the operations of each of the branches of farming that enter into the combination. The selection of varieties of the chosen crop, the cultural methods to be pursued have to be considered, and, not least, the lay-out of the farm in such a way that economical working is secured. It is in regard to this that surveyors are particularly interested, for they can do a very great deal toward enabling land to be used to greater advantage.

The general lay-out is of the utmost importance in regard to the economical working of a farm. An unsatisfactory design leads to endless loss, both in connection with actual working operations and in maintenance, and frequently involves considerable expense in remedying initial mistakes.

Initial Mistakes in Laying Out a Farm.

Difficulties in this respect usually arise through farmers not being in the position in the first place to fully develop the farm, and to a piecemeal programme being adopted without regard to ultimate development. Even on some of the Government experiment farms in the early days of the

* Paper read at the Conference of Staff Surveyors, Sydne April, 1924.

Department such a course was adopted, and in consequence great expense has had to be incurred in making alterations to fencing, buildings, &c., in order to enable the farm to be economically worked.

The Department Engages a Surveyor.

It is now the practice of the Department to engage a surveyor to assist in the planning of all new farms. The particular value of this is that the services of an expert are secured, and a design can be worked out which can be gradually developed, and which will not only be satisfactory during the initial stages, but will also be satisfactory when the farm is fully developed.

It will be clear from what has been said in regard to the business of farming that success can only come by producing at the lowest possible cost. Economical working of the farm is greatly facilitated when it is designed in such a way that each part of it is easily and quickly accessible.

Accessibility to Paddocks.

This is obvious and yet it is remarkable how many farms are badly designed in regard to accessibility, and how much time is lost in going to and from paddocks. In both the cultural and harvesting operations, time is of great importance. Under certain circumstances in regard to weather, the loss of even a day in a season's operations, whether sowing or harvesting, may mean many pounds to the farmer. If a paddock is only half an hour's journey from headquarters, a day is quickly lost. By the adoption of a plan early in the development of the farm, the paddocks, particularly those used for cultivation, can generally be arranged in such a manner that they can be easily and quickly reached from headquarters.

Location of Buildings, Access, and Water Supply.

There are certain main features to be taken into consideration in laying out a farm which determine the plan to be adopted. These are the location of the homestead and farm buildings, the means of access, the location of the water supply, the nature of the soil, and the main purpose for which the land is to be used. Under certain circumstances, each or all of these may present no difficulties, while in others considerable care must be exercised before a final choice is made. A suitable plan can only, of course, be formulated by co-operation between the farmer, who understands the nature of the land and its suitability for crops, pastures, &c., and the surveyor.

The means of access should receive careful consideration, particularly with a view to securing a road to the farm which will have the easiest possible grades, and which can be maintained at the least cost. Time spent in determining the best road is well repaid by the saving which will follow.

The location of the water supply requires very careful consideration. In some cases there may be only one site available, but as a rule there are a number from which a selection can be made for the main supply. In

selecting a site, consideration must be given to the catchment, both in regard to the sufficiency of the run-off of water and with a view to minimising silting as far as possible.

In fixing the site of a water supply, careful consideration needs to be given to the arrangement of the paddocks, or alternatively the paddocks should be planned around the water supply, so that each will be served with water at least expense.

Planning of Grazing Paddocks.

While it is important that the paddocks used for cropping shall be as near as possible to the farm buildings, it is also advantageous to leave the pasture paddocks grouped as nearly as possible to the farm buildings, so that stock in moving around the paddocks can be seen without difficulty. This is particularly important on small farms where a man cannot be specially employed in connection with the stock when the farmer is taken up with his crops.

The Nature of the Land Affects the Plan.

In planning the crop paddocks, apart from accessibility, consideration must be given to the nature of the land and its suitability for various crops. Irregular boundaries are, of course, objectionable, as they render difficult the handling of large teams, and some care must be exercised in order that land may be enclosed satisfactorily with the least irregularity in this respect.

Effect of the Nature of the Soil.

The design of a farm must be determined to a very large extent by the character of the soil. Attention must be given to minor as well as to major differences. On a mixed farm, suitable partly for grazing and partly for crops, the first step is the division of the areas to be used for pastures and for cropping.

In deciding upon the subdivisions, consideration must be given, among other things, to the differences in the soil. Uniformity of soil in a paddock leads to economical working in various ways. Thus, on one class of soil, cultural operations may be most satisfactorily carried out by one class of implement, while on another class of soil other implements must be used to give the best results.

Again, in wheat-growing it frequently happens that the wheat on one class of soil will need grazing off, while on other soils it is not needed. Sheep put into a wheat paddock containing two such classes will invariably eat the wheat which does not need grazing and neglect the other. Unless the two classes are separated by permanent fencing, some improvised means must be adopted to control the sheep.

Again, certain classes of soil on a farm may be suited to particular crops. Thus there may be areas suited for lucerne, or some may be particularly

suited for fruit. The presence of such areas, and the desire of the farmer to utilise them in this way may materially alter the design of the farm in order that economical working may be possible.

Location of the Fencing.

One very important factor to be considered in designing the paddocks is the suitability of a proposed line for fencing. The location of a fence on areas subject to flooding leads to endless trouble and expense. Fences are washed away and must be replaced, while there is continual danger of rabbits finding their way into the holdings or into the paddocks within the holdings.

Plan of the Farm Buildings.

The adoption of a sound plan for the farm buildings is also essential to the satisfactory working of the farm. This includes the selection of the site, and the location of the various buildings in relation to each other.

A number of points need to be considered in fixing the site, among which are accessibility to the nearest public road, the position of the permanent water supply, the position of the farming area, and the suitability of the soil for gardening purposes.

The last is a point to which as a rule very little thought is given. Often in the early days of a farm the farmer has no time to beautify his home or to attempt to grow vegetables, fruit, &c., and the home site is chosen without thought in this direction. Ultimately, when attempts are made to establish a garden or orchard, they result in failure and considerable loss to the farmer owing to the unsuitability of the soil. A garden can only be successfully established near the home, where a little time can be devoted to it frequently and where it will be protected from birds, &c. Not so much attention has been given by many farmers to the advantages to be gained by growing much of their own food on the farm, but with mounting costs and the difficulties in securing profitable returns for the products that are sold off the farm, farmers are endeavouring to make their farms more self-supporting. Furthermore, the pioneer stages of farming are passing in most districts, and farmers and their wives are acquiring greater knowledge and thriftiness, and both these things are making the farm garden and vegetable plot of increasing importance.

Grouping of the Buildings.

In regard to the grouping of the buildings, it is important that they be not clustered closely together, if only on account of risk of fire. Some buildings, such as the farm smithy, are a source of great risk, and if located near other buildings, will lead to heavy insurance charges. The risk of loss in any case is greater when all the buildings are close to each other.

In arranging the buildings, attention must be given to convenient working. The haysheds, for instance, should be reasonably close to the stables. Needless to say, good drainage should be assured.

Conclusion.

These suggestions indicate that the economical working of a farm depends to a great extent upon it being well planned. To ensure a satisfactory plan the considerations thus briefly put forward must be taken into account when the boundaries are first defined, and must also be followed within those boundaries.

It is not always possible to make a plan which will last for all time, but if a definite plan is made in the first place it will usually be found that any subsequent alterations will only be of a minor character.

"Farm Equipment for Mechanical Power."

In "Farm Equipment for Mechanical Power," Frank N. G. Kranich presents to farmers a complete, copiously illustrated, and up-to-date book. "Mechanical power is to-day successfully replacing animal power in agriculture," says the author at the beginning of his preface, and according to the degree in which he subscribes to this proposition the *Gazette* reader will judge the probable interest and usefulness of the book to him.

The book contains three main parts—draft machinery, belt-driven machinery, and miscellaneous topics, and under each of these headings most readers will find information of value. The American agriculturist (and manufacturer, dealer and distributor of machinery) will probably find this publication of greatest use, but the immense amount of material it makes available gives it also a value that is almost world-wide. It is published by the Macmillan Company (New York), from whose London office our copy was received.

Plant Breeding in Relation to Cotton.

Many persons imagine that all that need be done is to import sufficient seed of a good variety from America in order to plant our cotton area here, but this, unfortunately, is not possible in practice. In the first place all seed that is imported from America has to come from a source certified by the U.S.A. Department of Agriculture, must be fumigated, and, if possible delinted with sulphuric acid. This, therefere, limits us to the importation of small quantities of seed since these quarantine precautions are absolutely necessary if we are to keep out exotic diseases and pests. Secondly, any variety which is newly imported shows what is known as "new place effect," *i.e.*, it is inclined to vary in staple, habit of growth, and other characters, and become uneven. This phenomenon is well known in other countries, and is probably caused by the variety making an effort to acclimatise itself to the new conditions. It has already been observed in the Durango variety which was imported into Queensland three years ago, and it has become abundantly obvious that we shall have to adopt careful methods of selection within this variety if we are to get types particularly suited to this country. Further, in such an extensive country as Australia, it is perfectly obvious that one variety will not suit all parts of the cotton belt, and we shall therefore have to breed cottons to suit particular localities.—Colonel G. Evans, Director of Cotton Culture, Queensland Department of Agriculture.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1923-24.

Yanco Irrigation Area.

A. N. SHEPHERD, Senior Agricultural Instructor.

ALTHOUGH potatoes are not grown to any great extent on the Murrumbidgee Irrigation Area, with reasonable care and attention to cultural and irrigation methods those settlers on the lighter class soils can produce good payable crops. Generally two crops are raised annually, one in the spring and the other in the autumn; and although the later planting usually gives the better results with less care and attention, trouble is experienced in several ways—in regard, for instance, to seed supply and to marketing of the crop, which is harvested when one may expect competition from the main crops of other districts, including the tablelands. It thus appears that the irrigation farmer who devotes part of his land to potato-growing should aim at an early spring planting, and thus obtain the high prices ranging for early potatoes.

The following farmers co-operated with the Department in carrying out trials during the spring of 1923:—

J. Hetherington, Farm 338, Wamoon.
R. Davidson, Farm 883, Stanbridge.
H. Markey, Farm 964, Leeton.
W. M. Evans, Farm 139, Stony Point. Leeton.

Owing to the exceptionally wet winter, the land did not receive the thorough preparation necessary for the production of big yields of potatoes. A most changeable season was experienced during the growing period, and although showers occurred during the spring the rainfall was below the average. Very hot weather was experienced during December, readings of over 100 degrees being registered for six consecutive days. The rainfall registrations at Leeton were as follows:—August, 127 points; September, 151; October, 104; November, 32; December, 161.

The Plots.

Farm 338.—Variety trial, on red sandy loam. Land ploughed in July, disced and harrowed and again ploughed on 7th September, the sets being dropped 15 inches apart in every third furrow with superphosphate at the rate of 2 cwt. per acre. Splendid germination was obtained, the plants making good growth. The plot was irrigated once in October, twice in November and in early December. The tubers were dug in December and, although the crop was not heavy, a very fair sample of potatoes was obtained.

Farm 883.—Manurial trial with Early Manistee. Red sandy loam. The potatoes were planted 15 inches apart in rows 3 feet apart on 3rd September at the rate of 10 cwt. per acre in all cases. The plot was planted among young fruit trees, four rows between the rows of trees. Good germination resulted. The portion fertilised with P9 mixture made most growth, the haulms being very healthy with a dark-green colour. The top-growth was also much more prolific than in the other sections of the plot, and eventually gave a heavier return. The plot received irrigations in mid-October and at the beginning and end of November.

RESULTS of Variety Trials.

Variety.	Farm 968.				Farm 338.			
	t.	c.	qr.	lb.	t.	c.	qr.	lb.
Early Manhattan	2	8	1	23	2	8	1	0
Factor	2	0	2	21	3	1	0	20
Early Manistee	2	1	3	17	2	14	3	0
Satisfaction	1	16	1	26	2	1	3	0

RESULTS of Fertiliser Trials.

Fertiliser per acre.	Farm 883 (Early Manistee).				Farm 139 (Factor).			
	t.	c.	qr.	lb.	t.	c.	qr.	lb.
P9, 4 cwt.	3	0	1	4	0	14	0	0
P7, 2½ cwt.	2	16	1	4	0	9	0	0
M7, 3¼ cwt.	2	13	1	20	0	11	0	0
Superphosphate, 2½ cwt. ..	2	10	3	12	1	0	0	0
No manure	2	6	0	16	0	16	0	0

The mixture M7 consists of superphosphate 10 parts and chloride of potash 3 parts. P9 consists of superphosphate 10 parts, chloride of potash 3 parts, and sulphate of ammonia 3 parts. P7 consists of equal parts of superphosphate and bonedust.

Farm 968.—Variety trial, on new land that had been fallowed for some considerable time. Planted on 31st August, with seed at the rate of 10 cwt. and superphosphate at 2 cwt. per acre. Satisfaction were a good deal slower in germinating than the other varieties. Although they made good growth and appeared to be doing well, the plants were badly attacked by the Rutherglen bug about the end of October. The potatoes were dug late in December. The Early Manhattans gave the highest percentage of marketable tubers; the Early Manistee were rather on the small side. The crop received one watering in October and two in November, and was cultivated and hilled between irrigations.

Farm 139.—Manurial trial with Factor on red loam. The previous crop had been peas without fertiliser. Owing to the wet winter, the preparation that this particular soil calls for could not be carried out, and while as much work as possible was put into the land the ideal seed-bed was wanting. The sets were planted 15 inches apart in rows 3 feet apart on 10th September.

Only fair germination resulted, and although the plants received every attention, the results were disappointing. This was chiefly due to a heavy local rain experienced after irrigation in October, the water lying between the rows, super-saturating the land and killing many of the plants. Of those that survived, the main roots of many rotted, leaving only the surface roots to feed the plants. The results obtained cannot be taken into consideration in arriving at any definite conclusion as to the value of the respective manures, as the yields were influenced mostly by the number of plants that survived the water rather than by manurial effect.

The crop received two waterings in November and one in October, and after each irrigation the land was thoroughly cultivated. The potatoes were also well hilled.

Silage from Clover.

Clover silage, when well-made, is a very superior fodder, writes Frank T. Shutt, Dominion Chemist, in a publication of the Canadian Department of Agriculture. It is very palatable and of high feeding value by reason of its richness in protein. The more extensive adoption of this method of preservation of clover has no doubt been held back by the failures that have occurred in many instances to make good silage. Recognising the requirements and conditions necessary, however, it is not difficult to obtain clover silage of excellent quality. Clover as filled into the silo is lighter and as a rule less juicy than maize; consequently it needs more packing and heavier weighting to ensure exclusion of air. A narrow and high silo, to give a greater depth to the silage, is better adapted for clover than one which is broad and low.

A study of the composition of the clover plant at several stages of growth from "before bloom" to "ripe," indicates that the best time to cut for ensiling is about "full bloom"—when the first heads are beginning to wilt—and experience has shown that such clover makes excellent silage. If cut later than this stage the material is apt to be too dry to pack well.

To Control "Club-root" of Cabbage.

Club-root of cabbage, cauliflower, turnip, radish, &c., is due to a "slime-mould" (Myxomycete) known as *Plasmodiophora brassicæ.* Infection may take place in the seed-bed, and in such cases good control has been obtained by watering the seedlings with a solution made up of 1 ounce of corrosive sublimate to 2 gallons of water. Corrosive sublimate is *extremely poisonous* and must be handled with care and kept out of the reach of children.

Where infection takes place in the field the following measures are recommended:—

1. Grow susceptible crops on new land or on land that has been rotated with other crops.
2. Apply fresh unslaked lime at the rate of 150 bushels per acre.
3. Destroy by burning all refuse from a previous susceptible crop.

—G. P. Darnell-Smith, Director of Botanic Gardens and Biologist.

Melba XV of Darbalara.

FOREWORDS.

The Hon. Sir George W. Fuller, K.C.M.G., Premier of New South Wales.

THE world-record established by the Milking Shorthorn cow, Melba XV, is one of which not only dairymen but the people generally of New South Wales should feel proud.

It is all the more gratifying because it is not an accidental one, but, on the contrary, is the result of careful and systematic breeding. That fact in itself, is, to my mind, of far greater importance even than the prominence which the achievement will give to New South Wales in the whole world of dairying.

Mr. J. T. Cole, in bringing his breeding methods to such a high degree of perfection, has demonstrated in a very practical and striking manner the great economic value of scientific application to dairy production. He has set an example which all dairymen should endeavour to emulate, not only in their own interests, but for the credit of the State and the stability and status of the industry. He has established himself as one of Australia's great benefactors in the sphere of rural industry, and his work will provide an inspiring chapter in the history of our productive progress.

It is especially pleasing to me, as I am sure it will be to the people generally of the Illawarra district, to remember that Mr. Cole is a native of that part of the State. The Illawarra has long had a reputation for its fine dairy herds and high-class products, and that reputation has now been very considerably enhanced by Mr. Cole's splendid achievement.

In offering my congratulations and thanks to Mr. Cole, I am sure that I am voicing the feelings not only of readers of the "Agricultural Gazette," not only of every dairyman, but of every individual who appreciates the value of our dairying industry, and the great future that lies before it.

GEORGE W. FULLER.

The Hon. Frank A. Chaffey, Minister for Agriculture.

"Honor to whom honor is due." The wonderful achievement which has crowned the efforts of Mr. J. T. Cole has once more focussed the attention of breeders of dairy cattle throughout Australia—as well as in every part of the world where the question of milk and butter production engages the attention of stock owners and breeders—upon the possibilities of the dairy cow in our State.

Prior to the announcement of Melba XV's latest record, breeders all over the world had occasion to marvel at the results attained at Darbalara, and other

countries were stimulated to greater efforts, but the figures now published for the 365 days' test recently completed by this remarkable cow establish her supremacy beyond question, and stamp her breeder as a genius.

Two points stand out, and should be remembered: (1) *Melba XV is not a freak cow—the records of other animals of the same strain prove that*; (2) *the conditions under which the test has been conducted and the results checked, place the authenticity of her record beyond the shadow of doubt.*

The history of the various branches of agricultural and pastoral industry in New South Wales contains many episodes of which Australians can well be proud, and to the list of those who have blazed the trail in the past must be added the name of the man who has made the present achievement possible. His work must prove an inspiration to others, and I hope to see a vast improvement in the all-round standard of dairy cattle in our State within a short space of time.

FRANK A. CHAFFEY.

THE MAKING OF A WORLD'S BUTTER-FAT RECORD.

L. T. MACINNES, Dairy Expert.

ON 13th June, 1924, the well-known Milking Shorthorn cow, Melba XV of Darbalara, completed a 365-days' test under official auspices, during which time she gave 32,522½ lb. milk and 1,614 lb. butter-fat. For butter-fat production she thus surpasses all previous records made in any part of the world, and by any breed.

Eighteen months before, Melba XV herself established a world's record on her fourth calf, her production of butter-fat being 1,319 lb., but shortly after the record was beaten by the Canadian Friesian cow, Agassiz Segis May Echo, with 1,338 lb. butter-fat, given in 365 days, production being counted in her case from the date of the last calf.

This 1,338-lb. record by the Canadian cow has now been emphatically beaten by Melba XV, who, on her fifth calf, counting production from five clear days after calving, has proved herself an undeniable champion by yielding 276 lb. more butter-fat than her competitor.

It was in 1912 that the systematic testing of herd-book stud dams was commenced in New South Wales under the United Pure Bred Dairy Cattle Breeders' Association's Scheme operated by the Department of Agriculture. Over 4,000 cows have been recorded to 30th June, 1923, under this scheme. From 1st July, 1923, the testing of pure-bred stock has been carried out wholly under the control of the Department under a uniform scheme adopted by the Agricultural Departments of each State in Australia.

The Darbalara Stud.

The Darbalara stud was formed by the Scottish Australian Investment Co. Ltd. in 1899 at their Bolaro Station, situated in the highlands of the Monaro country. The foundation cows were selected as unbred yearling heifers in the Illawarra district by Mr. J. T. Cole, Manager of Bolaro, to

The World's Champion for Butter-fat Production.

Melba XV of Darbalara (No. 4,188, M.S.H.B.). Yield for 365 days, 32,522¼ lb. milk, 1,614 lb. butter-fat.

mate with the foundation sire, Banker of Bolaro (5), which animal had been bred by him. Mr. Cole is a native of the Illawarra, and, with his brothers. was breeding and exhibiting dairy Shorthorn cattle in the early seventies of last century. At that time the great sire, Major (imp.), was at the head of the fine herd founded by the late Mr. Evan Evans, whose son, Mr. Evan R. Evans, was carrying on the stud at the old home, "Penrose," Dapto. The northern side of the Illawarra district had, for at least twenty years before that time been one of the chief nurseries of Shorthorn cattle in Australia. At that time the old "dual purpose" Shorthorn was at its best in England, and some of the finest specimens of the breed that ever left the old country found their way to Illawarra, spreading later to other parts of the State as settlement advanced.

The foundation heifers of the stud at Bolaro were carefully selected as regards breeding, type and quality, and robust constitution was also considered essential for the purpose in view. As they came into milk these heifers were put under "home test," and any under standard were rejected. From those of outstanding production, bulls were kept to continue building up the herd. This practice has been followed down to the present time, and there is now a marked uniformity of type in the herd and a very high standard of production, while size, frame, and robust constitution have been well maintained where not improved.

It was at Darbalara (situated on the Murrumbidgee River some 14 miles from the town of Gundagai, New South Wales), that, on 17th September, 1912, the first lot of cows were submitted to the official tester. In some instances since that date individuals have been tested over five separate lactation periods. During this year, 1924, there are on test. representative heifers of the seventh generation counting from the original dams entered under the testing scheme in 1912.

On 17th September, 1913, one of the cows having freshened and given birth to a bull calf on 12th September, commenced her official test when 16 years of age. She yielded 7,763 lb. milk, and 308 lb. butter-fat, equal to 351 lb. butter, in the ensuing 273 days, and 9,184 lb. milk, 367 lb. butter fat, equal to 419 lb. butter (average test, 4 per cent.) over the 365 days' period. This cow was named "Madame," New South Wales Milking Shorthorn Herd Book No. 406, Volume I, Folio 111. From this grand old cow, Melba XV has descended.

Melba XV of Darbalara (M.S.H.B., Vol. IV, No. 4, 188).

Melba XV of Darbalara (4,188) was born on 2nd September, 1915. She is by Kitchener of Darbalara (419) from Melba VII of Darbalara (4,181), who is by Emblem of Darbalara (100) from Melba IV of Darbalara (1,576), who was by Carbine from Melba, of Darbalara, who was by Banker (5) from Madame (406), who was by Heather (27) from Podge II, who was by Prodigal from Podge.

Kitchener of Darbalara (419), the sire of Melba XV, is by Emblem of Darbalara (100) from Lily II (1,019), who was by Carbine from Lily (366), who wss by Banker (5) from Daisy (316), who was by Number from Frosty.

It is interesting to note that Emblem of Darbalara (100), the grandsire of Melba XV, and the original Melba of Darbalara, her great grand dam, are full brother and sister, both being by Banker (5) frcm Madame (406) back to both of which production tables can be calculated, and which, from the official record point of view, can be termed the foundation sire and foundation dam of Melba XV.

High production, to be extended consistently over a lengthy period, must be based on a strong physique. This is markedly exemplified in the instance under review. Melba XV is an exceptionally large-framed cow, dark red in colour, thick across the withers and wide between the shoulders, giving plenty of space for free heart and lung action. The brisket is deep and full. The barrel is large, ribs well sprung. Every part of the body denotes physical strength and robustness of constitution, and a capacity to turn large quantities of fodder into heat wherewith to nourish her own body and milk to nourish mankind. Looking at this cow and her herd mates, everyone is stiuck by these physical characteristics. The herd master (Mr. Cole himself) has not aimed at perpetuating the text-book cow, which should be thin across the withers, narrow shouldered, deep and wide across the hips—the typical wedge-shaped cow. The genius at Darbalara has striven to widen the point of the wedge without weakening the milking or business end of the cow. He has aimed primarily at breeding a strain capable of giving large quantities of milk fairly rich in butter-fat over long lactation periods, and of passing on this inherited attribute to future generations, and yet strong enough to give birth to a calf every year. In addition he has evolved a type that carries a frame capable of being fattened for sale as beef.

In short, the aim has been to evolve the perfect dual-purpose animal, and judging by results these long continued efforts have succeeded.

From her first calf Melba XV has been tested each lactation period, and the following summary of the tests is interesting as showing that she consistently improved each time.

No Test Record.	Age.		Date of Commencing.	Yield			Period	Date of Calving.
				Milk.	Fat.	Average Test.		
	Yrs.	Mths.		lb.	lb.	Per cent.	Days.	
1	2	5	20-2-18	8,844	395·073	4·5	273	7-2-18 F.
2	3	6	18-3-19	13,510·5	587·13	4·3	273	12-3-19 M.
3	4	8	9-5-20	18,131·25	773·302	4·3	273	28-4-20 M.
				21,635·5	954·472	4·4	365	
4	6	5	17-2-22	22,597·5	988·179	4·4	273	4-1-22 M.
				29,432	1,316·812	4·5	365	
5	7	9	4-7-23	26,863·5	1,292·325	4·8	273	9-6-23 F.
				32,522·5	1,614·1	5·0	365	

THE FOURTH TEST.

The fourth record is worthy of some special comment before the fifth, now just completed, is described. On 4th January, 1922, Melba XV gave birth to a bull calf. She should have been submitted for testing purposes on 15th January, when the official tester made his usual monthly visit, but unfortunately she went down with milk fever shortly after calving, and was in such bad health that the commencement of her test had to be postponed. The commencing test could not be made until 17th February, which was forty-four days after calving, or, making allowance for discarding the first four days' milk (colostrum) as per the rules governing the New South Wales testing scheme, the first samples were taken for the official test forty days after the cow was eligible for testing. As under the testing rules the maximum

Banker of Bolaro (No. 5, M.S.H.B.).
Sire of Emblem of Darbalara, and of the original Melba of Darbalara.

number of days that could be retrospectively taken into the calculations was thirty-three, Melba XV could not receive credit for the first eleven days' milk (including the disallowed first four days).

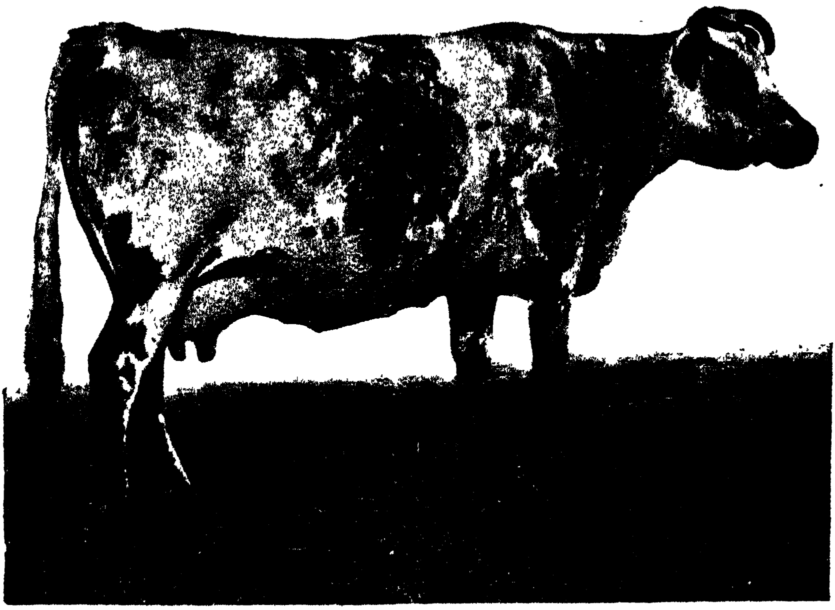
Method of Calculating the Official Record.

All calculations made by the Department of Agriculture for official tests were then under one of the three following methods :—

Scale (*a*).—In the case of cows tested within fourteen days inclusive after calving, the period of 273 days is covered by ten tests, and in the case of cows completing a 365-days test by thirteen tests, the last test to be made not more than ten days before the end of the period. In order to calculate the yield for the first period (thirty-three days) the milk weights and butter fat tests of the first two tests are averaged; for the second period the results of the second and third tests are averaged; and so on, until the last period, when the average is calculated of the twelfth and thirteenth tests or the ninth and tenth tests, as the cases may be.

Scale (*b*).—In the case of cows tested fifteen to twenty-four days, both inclusive, after calving, the original method of the United Pure Bred Dairy Cattle Breeders' testing scheme holds good. The whole period is covered by nine or twelve tests only, as required to complete 273 or 365 days respectively, and the tester's records are accepted without averaging with proximate tests, unless they are abnormal.

Scale (*c*).—In the case of cows tested twenty-five or more days after calving, the calculations made on the first test and weights of milk count backwards to cover a period of thirty-three days, or in the event of the test being made under the thirty-seven days after calving to within four clear days after calving; in which case the balance of this first period is calculated forward from the date of test until the thirty-three days are completed. Each succeeding calculation is computed on an average with the preceding test; that is, the second calculation is made on the average results of the first and second tests, the third calculation on the second and third tests, and the last calculation on the average results of the eleventh and twelfth tests. The whole period is covered by nine or twelve tests, as the case may be.



Madame of Bolaro (No. 406, 2, M.S.H.B.),

Dam of Emblem of Darbalara and of the original Melba of Darbalara. Photograph taken when 21 years of age, carrying last calf.

Official test at 16 years old: 7,763 lb. milk, 308 lb. butter-fat, in 273 days.

If Melba XV had not contracted milk fever she would have been classified under scale (*b*); but, as her test was delayed beyond twenty-five days after she calved, the calculations were made under scale (*c*). Under this, eleven out of the twelve tests had to be averaged, the result for the second sub-period being arrived at by making a joint computation from the first and second tests, the third sub-period by averaging the second and third tests, and so on.

In New South Wales all cows have to be stripped out under official supervision before the test covering a sub-period commences. The last weight and test sample is taken twenty-four hours after the cow is first stripped out.

RESULTS of Melba XV's 1922-23 Test.

Date of Tests.	Milk, for day	Milk, for Sub-period.	Butter-fat, per day.	Butter-fat, for Sub-period.	Testing Period.
1922.	lb.	lb.	lb.	lb.	Days.
17 February ...	85	2,805	3·288	108·504	33
22 March ...	80¾	2,422½	3·1295	93·885	30
25 April	78½	2,355	3·2285	96·855	30
23 May	82½	2,475	3·59	107·7	30
24 June	84½	2,535	3·9565	118·695	30
26 July	84¼	2,527½	4·096	122·88	30
29 August ...	87¼	2,617½	4·1195	123·585	30
28 September ...	86¼	2,587½	3·8875	116·625	30
29 October ...	75¾	2,272½	3·315	99·45	30
27 November ...	70¾	2,122½	3·345	100·35	30
23 December ...	76½	2,371½	3·7005	114·715	31
1923. 17 January ...	75½	2.340½	3·6635	113·568	31
Total ...	...	29,432	...	1,316·812	365

The maximum yield for twenty-four hours at any of the tests was 90·5 lb. milk, 4·266 lb. fat, made on the seventh test (29th August). Owing to being badly bloated (hoven) from eating clover in October, she suffered a further set-back, as was manifest in a yield of only 69½ lb. milk, 3·121 lb. fat. On the last test (17th January, 1923) she gave 70 lb. milk, 3·495 lb. fat, which was ·207 lb. fat in excess of the first test (17th February, 1922). These figures represent the actual yields on the days cited, and not the calculations made by averaging for the official record, and tabulated above.

As has been mentioned above, the method of calculating records was altered on 1st July, 1923, in order that there might be uniformity of procedure throughout Australia. Under the agreement entered into by all States of the Commonwealth, the averaging system has been dropped, and all calculations for sub-periods are now made by straight-out multiplication of the results of the twenty-four hours' test by the actual number of days in the sub-period.

Comparing the 1922-23 performance with what would have resulted if the record had been computed on the system now in use, it is seen that Melba XV was under a disadvantage by averaging her tests. On straight-out calculations her yield for the 365 days would have been 29,150 lb. milk, 1,320·16 lb. fat. As the averaging system has only been used in this State, it is obvious that for comparison purposes with records from other countries

and future records in Australia, Melba's fourth test record should be taken on the straight-out calculations, but as it has now been surpassed by her new record, the matter need not be further stressed.

Supervision of the Fourth Test.

Such a performance as Melba XV's is recorded under careful Departmental supervision. During the fourth test the testing officials were frequently changed, and, in addition, the Assistant Dairy Expert and Senior Dairy Instructors attended at short intervals to check the tester's work. The senior departmental officers mentioned visited the stud between the regular official tests, and also stayed on the premises continuously during the last seventeen days of the period to take weights and samples of each milking, and to test and record all conditions affecting the performance.

Details of Feeding.

Mr. J. T. Cole states that since Melba XV was weaned at about 6 months old, she has not had milk of any kind, nor has she ever had stimulants or drugs.

During the test she was fed as follows:—

February to May.—1½ lb. linseed, 2½ lb. pollard, 3 lb. cracked maize, 5 lb. bran three times a day; grazed one hour per day on lucerne, and a quantity of green maize (in May, no green maize).

June to October.—9 lb. maizemeal, 9 lb. pollard, 15 lb. bran, 6 lb. oaten chaff, 6 lb. linseed meal; bundle of corn stalks (dry) and grazed on lucerne a few hours daily (August to October, also grazed on prairie grass).

November.—8 lb. maizemeal, 6 lb. pollard, 6 lb. bran and 3 lb. linseed meal daily, divided into three feeds (4 a.m., noon, and 8 p.m.), made into a very soft mash; also small bundle of oaten hay at noon in addition to pasture.

December.—6 lb. boiled maize, 6 lb. pollard, 6 lb. bran, 3 lb. linseed meal, prepared into a soft mash, divided into three feeds and fed at 4 a.m., noon, and 8 p.m.; small quantity of oaten hay at noon.

January.—6 lb. boiled maize, 6 lb. pollard, 6 lb. bran, 3 lb. linseed meal prepared into a soft mash, divided into three feeds and fed at 4 a.m., noon and 8 p.m.; small quantity of oaten hay at noon

The Cost of Feeding Melba XV.

In connection with obtaining such records as that of Melba XV, the question is often raised whether it pays to feed so extensively. There is a tendency in some quarters to confuse stud breeding with ordinary dairy farming, although there is a big distinction. In ordinary dairy farming the principal source of income is the sale of milk or its products, such as cream, butter, cheese. The revenue obtained by the sale of calves or surplus stock is secondary. In the case of the stud breeder, however, it often happens that the income obtained from the sale of young bulls, &c., is much greater than that from the sale of milk, &c. In any case, the income from the sale of stud stock is primary, and not secondary.

As the dariy-farmer must perforce make his profit out of milk sales he can only spend on fodder sufficient to allow himself a profitable margin; should his feed bill be out of proportion to his income he must soon go bankrupt, or, at the least, must show that farming is unprofitable. The stud owner,

on the other hand, is in a position to spend a greater percentage of his milk income on fodder, because he is recouped by high prices for his young stock. He looks to get bigger records from his stud cows with judicious heavier feeding, and the higher the record the greater the value to be placed on the progeny. This increase in values is not limited to the one offspring, nor to one generation; it is passed on to all offspring of that strain.

Melba XV's records will have an effect on the prices obtained for the Darbalara Melba strain for many years to come. When it is viewed on these lines, it is hard to state how much profit such a cow has made over and above the amount expended in feeding and caring for her.

As to the actual amount expended by the Scottish Australian Investment Company Ltd., apart from pastures and fodder crops grown on the estate, a sworn declaration has been made by Mr. Cole in the following terms:—

Sworn Declaration No. 21.

New South Wales.

To Wit.

I, John Thomas Cole, Manager of Darbalara Estate, Gundagai, in the State of New South Wales, do hereby solemnly declare and affirm that the total quantities and values of concentrated food consumed by the Milking Shorthorn cow, Melba XV of Darbalara (4188) during the twelve (12) months of her last lactation period were as follows:—

	£	s.	d.
3,126 lb. Maize, value	9	15	4
4,218 ,, Bran, value	27	2	0
2,866 ,, Pollard, value	16	2	6
1,772 ,, Linseed meal, value	14	4	6
954 ,, Oaten chaff, value	2	2	6
Total cost	£69	6	10

And I make this solemn declaration as to the matter aforesaid according to the law in this behalf made and subject to the punishment by law provided for any wilfully false statement in any such declaration.

(Signed) J. T. Cole.

Taken and declared at Gundagai in said State this 28th day of April, A.D. 1923.

Before me,

(Signed) Frank F. Forster, J. P.

To this total £69 6s. 10d. there must be added the value of the pasture and green fodder consumed. As regards the former, it would be negligible during the summer months. A fair quantity of green lucerne and green maize stalks was used, but the whole can be liberally valued at £10 or £11, making the total for feed, say, £80; Melba XV's share of the cost of attendance can be put down at, say, £25, making a grand total of £105 for the year. As a set-off to this there was the income derived from sale of butter, the value of the skim milk for pig and calf feeding, plus the value of the heifer calf, which was born on 9th June, 1923, whose sire was Limelight of Darbalara. It would be safe to say that this heifer could not be bought at thousands of guineas, but a definite value can be placed on the butter and skim milk produced. Approximately 1,316·812 lb. butter fat is equal to 1,547·25 lb. commercial butter, allowing the moisture content to be 16 per cent. and the minimum fat content 82 per cent., and losses for separating, churning, and packing, &c., to total 1 per cent. After the cream had been separated

29,432 lb. of whole milk of an average test of 4·4 per cent. fat would represent 2,614 gallons of skim milk. The total value of the production was therefore :—

	£	s.	d.
1,547¼ lb. butter at average New South Wales monthly ruling rates for full period of 1s. 5d. per lb.	109	12	11
2,614 gallons of skim milk at 1d per gallon ...	10	17	10
Total	£120	10	9

It will be seen, therefore, that the cost of feeding and caring for Melba XV was considerably less than the value of her production in milk, &c. In addition, there is the value of her progeny and the enhanced reputation of the Darbalara stud. This can only be estimated, but the Company would probably prefer to have Melba XV's record than £10,000.

MELBA XV'S FIFTH TESTING PERIOD.

Most breeders would have been content with Melba's fourth achievement, especially as during the last strenuous four months she carried a calf, to which she gave birth on 9th June, 1923. Mr. Cole, however, decided to enter her for official test for the fifth time, and to give her the task of excelling her own previous world's record under the rules of the recently inaugurated Australian testing scheme conducted by the Department of Agriculture. Under the new rules the first five days' milk (colostrum) was discarded, and the averaging system of calculating was discontinued.

The first official test was taken on 4th July, 1923, and the last on 5th June, 1924. The details of the record are as follows :—

RESULTS of Melba XV's 1923-24 Test.

Date of Tests.	Milk, for day.	Milk, for Sub-period	Butter-fat, per day.	Butter-fat, for Sub-period	Testing Period.
1923.	lb.	lb.	lb	lb.	Days.
4 July	87½	2,625	4·367	131·01	30
1 August ...	105½	3,165	4·61	138·3	30
29 ,, ...	110½	3,315	4·76	142·8	30
25 September ...	102	3,060	4·386	131·58	30
23 October ...	97½	2,925	4·092	122·76	30
17 November ...	104	3,120	5·041	151·23	30
21 December ...	92½	2,775	4·783	143·49	30
1924.					
23 January ...	97½	2,925	5·401	162·03	30
21 February ...	89½	2,685	5·125	153·75	30
27 March ...	72	2,160	4·08	122·4	30
1 May	69	2,070	4·048	121·44	30
5 June	48½	1,697·5	2·666	93·31	35
Totals ...	...	32,522·5	...	1,614·1	365

The Previous World Record.

The record of the Canadian Friesian cow, Agassiz Segis May Echo, made last year with four milkings a day was 1,338 lb. butter-fat in 365 days. Melba XV during her latest performance reached this figure on the 285th day

of her official test. If the calculation had begun from date of calving, as in Canada, the Friesian's record would have been beaten in 280 days.

The highest butter-fat production reached during the test was obtained on 23rd January with 5·401 lb. for the twenty-four hours. The greatest amount of milk given in a similar time was 110¼ lb. on 29th August. The yield for October was affected by an attack of hoven, and early in March she had a bad attack of mammitis and fever. During this latter crisis, she had to be taken off all concentrated foods and given only a small quantity of green fodder. In addition, for some time she had to be milked every half hour. It speaks volumes for her constitution that she could recover so far as to yield 72 lb. milk, 4·08 lb. fat on 27th March, when officially tested. The set-back was so severe, however, that all yields subsequently made were about 1 lb. fat per day below the quantity given in February

Kitchener of Darbalara (No. 419, M.S.H.B.)
By Emblem of Darbalara, from Lily II of Darbalara, sire of Melba XV of Darbalara.

and just prior to the attack. On 31st May a chill in the udder was contracted through lying out on frosted ground. This, again, caused lessened production, as shown by the twelfth test.

The Milk Yield.

The yield of 32,522½ lb. milk while not a world's record (which is held by an American Friesian cow with over 36,000 lb.) is sufficiently high to be included amongst the foremost records, and easily establishes a fresh record for Australia for all breeds. It is believed it establishes a world's record for milk with an average test of 5 per cent. fat.

The Record Yield in Terms of Commercial Butter.

If Melba XV's record yield of butter-fat is estimated in terms of commercial butter on the Australian standard of 83 per cent. fat, it would equal 1,944¼ lb. commercial butter. On the American standard of 80 per cent. fat it would equal 2,017 lb. commercial butter.

As most other high records have been made in North America and the commercial butter is calculated there on the 80 per cent. basis for comparative purposes, the 2,017 lb. record may be used if the yield is to be referred to in terms of commercial butter, though it is preferable to use butter-fat.

The Condition of the Champion.

Melba XV entered upon her trial just completed in first-class physical condition and health. Except for the periods when she was sick, first through hoven (during the fourth sub-period), second with mammitis (during the eighth sub-period), and third from udder chill (in the twelfth sub-period) her health was excellent, and she fed and rested well.

Melba VII of Darbalara (No. 4,181, M.S.H.B.).
By Emblem of Darbalara, from Melba IV. of Darbalara, dam of Melba XV. of Darbalara.
Official test: 17,864 lb. milk 869 lb., butter-fat, in 365 days.

An extraordinarily robust constitution, and a placid temperament, stood to her and enabled her to finish up in good condition and without much loss in weight.

She was served on 22nd March by Limelight of Darbalara, (M.S.H.B. Vol. V, No. 1105), and is due to calve on or about 17th December, 1924. That she has been pregnant for the last eighty-three days of the test period gives added interest to the record made.

The Last Days of the Record Performance.

In carrying out these important tests the Department has striven to make the result acceptable in all parts of the world as a true and reliable record of what this wonder-cow can produce.

The twelfth official test was taken on 5th June in the presence of a Senior Dairy Instructor attached to the Dairy Branch. This officer stayed on to weigh samples and to test and record every milking from 5th to 13th June, on which latter date at mid-day the official period of 365 days was completed.

Previous to this another Senior Dairy Instructor had similarly taken tests of each milking from 31st May to 5th June. Frequent check tests were also made between the monthly official tests throughout the period and the work of the official testers was supervised and checked by the Assistant Dairy Expert and other senior officers, and by frequent changes of the testers themselves.

The Yield of the Last Days of the Test.

From 6th June, when the last official test was made, every milking was supervised, weighed, sampled, and tested three times a day right up to noon 13th June, when the full period of 365 days was completed. The record of these show how Melba XV more than maintained the yield officially credited to her on 6th June, which yield was multiplied by thirty-five to make the record of the twelfth sub-period in accordance with the rules of the Australian official testing scheme.

WEIGHT, Test, and Butter-fat for Last Nine Days.

—	—	Milk.	Butter-fat.	Butter-fat.	Remarks.
		lb.	Per cent.	lb.	
5 June ...	Noon	14	5·7	·798	Weather cold and wet.
	8 p.m.	15½	5·5	·8525	
6 " ...	4 a.m.	17½	5·5	·9625	Cold and wet; some hail.
	Noon	15½	5·5	·8525	
	8 p.m.	15½	5·8	·899	
7 " ...	4 a.m.	17	5·3	·901	
	Noon	15	5·5	·825	
	8 p.m.	14½	5·4	·883	Cold and raining.
8 " ...	4 a.m.	16	5·4	·864	
	Noon	14	5·7	·798	
	8 p.m.	15	5·6	·84	Cold and cloudy.
9 " ...	4 a.m.	16	5·6	·896	
	Noon	14½	5·7	·8265	
	8 p.m.	15½	6·1	·9455	Cold and cloudy.
10 " ...	4 a.m.	16½	5·6	·924	
	Noon	14½	5·7	·8265	Cold and cloudy; frosty night
	8 p.m.	15	5·8	·87	
11 " ...	4 a.m.	17	5·8	·986	
	Noon	14½	5·7	·8265	Warm day; frosty night.
	8 p.m.	15	5·8	·87	
12 " ...	4 a.m.	16	5·7	·912	
	Noon	14½	5·7	·8265	Warm day; frosty night.
	8 p.m.	14½	6·2	·899	
13 " ...	4 a.m.	17½	5·8	1·015	Warm day.
...	Noon	14½	5·9	·835	

The yield of over 4½ gallons of milk, testing practically 6 per cent. and giving about 2¾ lb. of butter-fat on the 370th day after calving is a performance

worthy of particular note especially as the tests show an increase from the time she began to recover from the chill contracted on the 31st May.

How Melba XV was Fed for the Great Record.

Mr. Cole has supplied the following authenticated accounts covering the feeding of Melba XV from June, 1923, to June 1924.

QUANTITIES and Cost of Food Supplied.

				£	s.	d.
120 lb.	Wheaten chaff	at 6s. per cwt.	......	0	7	0
1,226 ,,	Cracked maize	at 4s 6d. per bushel	...	4	18	6
1,160 ,,	Crushed oats	at 4s. 6d. ,,	...	6	10	6
517 ,,	Barley	at 5s. ,,	...	3	4	6
3,260 ,,	Bran	at 1s. 6d. ,,	...	12	4	6
2,398 ,,	Pollard	at 1s. 8d. ,,	...	9	19	10
507 ,,	Linseed meal	at 2d. per lb.	...	4	4	6
456 ,,	Oil cake	at 2d. ,,	...	3	16	0
31 ,,	Cotton seed	... ...	...	0	5	0
15 ,,	Molasses	... ...	...	0	5	0
9,690 lb.				£45	15	4

In addition to the above good pasture land was provided, and green fodder was plentifully supplied from crops grown on the estate. The monthly rations given were as follows :—

July.—4 lb. wheaten chaff, 6 lb. crushed corn, 3 lb. meal, 6 lb. pollard, 8 lb. bran daily; also oaten and lucerne hay.

August.—3 lb. Meggitt's meal, 12 lb. bran, 4 lb. cracked corn, 5 lb. crushed oats, 4 lb. barley, and 8 lb. pollard daily; also three hours grass and two hours lucerne daily.

29th August.—12 lb. pollard, 9 lb. bran, 2½ lb. Meggitt's meal, 7½ lb. crushed oats 2½ lb. barley, 5 lb. cracked corn; two hours on green oats in morning, two and a half hours natural grasses, two-and-a-half hours green lucerne in evening, and oaten hay at night (one bundle).

September and October.—Only oaten hay and green lucerne until 18th September, when grain ration was recommenced in small quantities and gradually increased to the following :—2 lb. Meggitt's meal, 9 lb. bran, 8 lb. pollard, 7 lb. crushed oats, 2½ lb. barley and 5 lb. cracked corn daily.

November.—8 lb. pollard, 8 lb. bran, 5 lb. crushed oats, 6 lb. boiled corn, and bundle of green oats in stall at night; three and a half hours natural grasses, and two-and-a-half hours green lucerne.

December.—6 lb. pollard, 9 lb. bran, 6 lb. sunlight oilcake, 2 lb. barley, 3 lb. crushed oats daily; grass paddock three hours, green oats (well headed) two hours, green lucerne two hours, and bundle of green corn at night.

January.—6 lb. pollard, 9 lb. bran, 3 lb. sunlight oilcake, 1 lb. boiled barley, 2 lb. crushed oats, 2 lb. Meggitt's meal, and green corn to desire midday and night; three hours natural grasses, and three hours on lucerne.

February.—4 lb. pollard, 10 lb. bran, 2 lb. sunlight oilcake, 1 lb. barley, 2 lb. crushed oats, 2 lb. Meggitt's meal, 1 lb. cotton seed nuts, and 4 lb. boiled corn; three hours grass pasture, two hours lucerne, and as much green corn as she could consume.

March.—3 lb. corn meal, 1½ lb. barley, 6 lb. pollard, 10 lb. bran, 1 lb. sunlight oilcake daily; four hours on green lucerne, and as much green corn as she could eat.

May.—3 lb. corn meal, 1½ lb. barley, 6 lb. pollard, 10 lb. bran, 2 lb. crushed oats, 1 lb. sunlight oilcake daily; two hours on grass paddock, two hours green lucerne, and as much green cobbed corn as she could eat.

June.—2½ lb. corn meal, 2 lb. sunlight oilcake, 1½ lb. Meggitt's meal, 6 lb. pollard, 10 lb. bran, 2 lb. crushed oats, ½ lb. molasses; two hours grass, four hours lucerne, and two bundles of dry cornstalks.

Cost of Feeding.

The cost of feeding was nearly £24 less than what was incurred during the preceding twelve months' test, although the yield of milk and fat was much greater. The diet was at the same time more varied. The lower rates ruling for all classes of feed during the last year would account in part for the reduction, but it will also be noted that the total weight of purchased food for the fifth test period was 9,690 lb., as against 12,936 lb. bought for the fourth test period. This difference was balanced by a larger allowance of green pasture and fodder crop being given.

The cost of attending on Melba XV was again about £25. The total cost of feed and attendance would thus come to some £85.

Another Picture of Melba XV.

This photograph (taken during the eighth month of the record test) shows the width across the withers and shoulders, and the depth of chest, affording room for great heart and lung action. The photograph accentuates the variation from the accepted idea of correct type in a dairy cow.

Estimating the amount of commercial butter produced on our Australian standard of 83 per cent. butter-fat to 100 lb. of commercial butter, we have on the average payments made to farmers which allow for deductions for manufacture and marketing :—

	£	s.	d.
1,944·66 lb. butter at 1s. 3d. per lb.	121	10	10
3,122 gallons of skim milk at 1d. per gallon ..	13	0	2
Total value of milk yield ..	£134	11	0

From this it is seen that the actual value of the milk produced exceeded the cost of production by £49. In addition, the Company has the value of the added prestige to the stud.

THE MELBAS AND HEREDITY.

Hereditary production can be divided into two sections; (*a*) that which is received from ancestors, and (*b*) that which is passed on to newer and future generations.

To scrutinise the individual records of the Darbalara stud and group them into certain strains is a liberal education in itself. Melba XV, if considered in this way, can be included in each of three main groups, viz.:—

1. Banker of Bolaro, her foundation sire with production records.
2. Madame of Bolaro, her foundation dam with production records.
3. Heather of Bolaro, the sire of the foundation dam.

1. *Banker of Bolaro.*—From 1912 to 1923, six generations of this sire's progeny have been officially tested for production over periods of 273 days. The individual records of these cows have been summarised to give the average production of each generation as follows:—

	No. of cows recorded.	Average Production		Average test.	Average age when tests began	
		Milk.	Fat.			
		lb.	lb.	Per cent.	Yrs.	mths.
First generation	5	10,050	395	3·9	10	0
Second „	30	9,148	377	4·17	5	9
Third „	28	7,601	*318	4·15	3	5
Fourth „	8	9,886	*424	4·26	3	5
Fifth „	3	16,220	*654	4·2	4	3
Sixth „	1	6,496	282	4·3	2	4
Average of 75 cows ...	...	9,000	372	4·13	4	10

* Brought to official mature standard the third generation equalled 442 lb., the fourth generation 591 lb., the fifth generation, 710 lb., and the sixth generation, 479 lb.

Included in these seventy-five records are those of—

	Average Production		Average test.	Average age.	
	Milk.	Fat.			
	lb.	lb.	Per cent.	Yrs.	mths.
14 heifers on first calf	6,635	278	4·2	2	3
8 heifers on second calf	7,375	308	4·2	3	3
5 cows on third calf	7,627	313	4·0	4	2

In most advanced registers of merit of the various dairy breeds in Australia and North America, the production at various ages is relatively standardised. Under the official Australian testing scheme for pure-bred dairy cattle now in operation, the comparisons are put as follows for the purpose of issuing official certificates :—

Junior 2 year old	—200 lb. butter-fat	(To get 350 lb. add	70 per cent.)
Senior 2 ,,	—225 ,, ,,	,, 350 ,, ,,	55 ,,
Junior 3 ,,	—250 ,, ,,	,, 350 ,, ,,	40 ,,
Senior 3 ,,	—275 ,, ,,	,, 350 ,, ,,	27 ,,
Junior 4 ,,	—300 ,, ,,	,, 350 ,, ,,	17 ,,
Senior 4 ,, ,,	—325 ,, ,,	,, 350 ,, ,,	8 ,,
Mature cows	—350 ,, ,,		

The official yields of Banker's progeny have been readjusted in accordance with this scale in order to arrive at their individual worth on the basis of all being mature cows when tested. The average of the productions thus obtained is : 11,071 lb. milk, 459 lb. butter-fat, equal to an average test of 4·14 per cent.

2. *Madame of Bolaro.*—The tested progeny of Madame of Bolaro are comprised in six generations. Her own record for 273 days' production, made when sixteen years old, is 7,763 lb. milk, 308 lb. fat, 4 per cent. test. The records of her thirty progeny are summarised in each generation as follows :—

	No. of cows recorded.	Average Production.		Average test.	Average age when tests began.	
		Milk.	Fat.			
		lb.	lb.	Per cent.	Yrs.	mths.
First generation	2	7,996	*335	4·2	3	0
Second ,, ...	4	9,931	386	3·9	9	0
Third ,, ...	8	8,445	*371	4·46	4	0
Fourth ,, ...	6	10,645	*450	4·2	4	3
Fifth ,, ...	7	11,237	*465	4·2	3	6
Sixth ,, ...	3	7,193	*314	4·3	2	10
Average of 30 cows ...	...	9,613	402	4·2	4	5

* Brought to mature standard, the first generation equalled 469 lb. fat, the third generation 428 lb., the fourth generation 525 lb., the fifth generation 525 lb., and the sixth generation 487 lb.

Included with these thirty are the records of—

	Average Production.		Average test.	Average age.	
	Milk.	Fat.			
	lb.	lb.	Per cent.	Yrs.	mths.
10 heifers on first calf	6,434	283	4·4	2	2
5 heifers on second calf	9,468	386	4·1	3	5
5 cows on third calf	8,333	343	4·1	4	1

Standardising the records of Madame's progeny to mature cows as in the case of those of Banker, the average production works out at 11,718 lb. milk, 496 lb. fat, equal to an average test of 4·23 per cent.

3. *Heather of Bolaro.*—The tested progeny of Heather of Bolaro now number thirty-two, extending over six generations. The average production of each generation is :—

	No. of cows recorded.	Average Production.		Average test.	Average age when tests began.	
		Milk.	Fat.			
		lb.	lb.	Per cent.	Yrs.	mths.
First generation	3	8,980	344	3·83	14	0
Second „	6	7,792	332	4·26	5	2
Third „	9	9,377	384	4·1	5	1
Fourth „	7	8,940	*400	4·4	3	3
Fifth „	3	15,650	666	4·2	5	7
Sixth „	5	13,220	†547	4·1	4	0
Average of 32 cows ...	...	10,085	428	4·2	5	9

* Brought to mature standard equals 543 lb. † Brought to mature standard equals 576 lb.

Included in these there are the records of :—

	Average Production.		Average test.	Average age.	
	Milk.	Fat.			
	lb.	lb.	Per cent.	Yrs.	mths.
9 heifers on first calf	7,286	313	4·3	2	0
5 heifers on second calf	9,224	374	4·05	3	3
4 cows on third calf	8,804	369	4·2	4	0

Standardising the yields of all Heather's thirty-two progeny, as in the cases of Banker and Madame, their average production is 12,141 lb. milk, 509 lb. fat, equal to 4·19 per cent. test.

Combined Records of Banker, Heather, and Madame Lines.

Taking the age-standardised records of these three strains and averaging each generation, there is obtained :—

394 lb. butter-fat for first generation.
364 „ „ second „
417 „ „ third „
554 „ „ fourth „
617 „ „ fifth „
531 „ „ sixth „

This shows an increase of about 35 per cent. butter-fat between first and sixth generations, though the sixth shows a falling-off (86 lb.) from the amount arrived at for the fifth generation.

Looking through the individual performances of the attached record lists of the three families (which are practically speaking, a trinity blended into one), it will be seen that the average butter-fat content of all milk yields is about the same, viz., somewhere in the neighbourhood of 4·1 per cent, very seldom going below 4 per cent., and at times reaching to 4·6 and 4·7 per cent., and once to 5 per cent. This is worthy of note, because in other countries the Milking Shorthorn has a reputation of giving milk with a low fat content, seldom exceeding 3·5 per cent.

The increased fat standard of the Darbalara cows is another illustration of the breeder's ability to build up his herd on the lines he desired.

Melba XXV of Darbalara.
Daughter of Melba XV of Darbalara. Yield on second calf: 10,169 lb. milk, 417 lb. butter-fat.

Big Yields among the Later Generations.

Another interesting fact that can be picked out from these records is the bigger milk yields obtained from the later generations. In the case of Madame's line there are in the fifth generation four cows out of seven giving over 1,000 gallons each. In the case of the Banker line there are two out of three with over 1,000 gallons in the fifth generation. In the Heather line in the fifth generation the whole have yielded over 1,000 gallons of milk each (averaging about 1,500 gallons), while in the sixth generation (younger stock) the average is about 1,200 gallons— three out of five cows recorded exceeding the 1,000 gallons.

Taking the whole of the first two generations of the three lines, only 30 per cent. of the records are over the 1,000 gallon mark, while in the fifth and sixth generations, the number is increased to about 60 per cent.

In each of these three lines the same cows' names appear—this because of the intense line-breeding which governs the operations of this stud. For instance, Melba XV is fourth in descent from Madame of Bolaro, fifth in descent from Heather, and fourth in descent from Banker of Bolaro.

RECORDS of the Direct Melba Female Line.

	273 Days' Production.		Test.	Age when test began.	
	Milk.	Fat.			
	lb.	lb.	Per cent.	Yrs.	mths.
Foundation—Madame of Bolaro ...	7,763	308	4	16	0
First descent—Melba of Darbalara ...	No official record.				
Second „ —Melba IV of Darbalara ...	11,763	498	4·2	11	0
Third „ —Melba VII of Darbalara...	14,371	712	4·9	6	0
Fourth „ —Melba XV of Darbalara...	26,863	1,292	4·8	7	9
Fifth „ —Melba XXV of Darbalara	10,169	417	4·1	3	7
Fifth „ —Melba XXX of Darbalara	6,897	322	4·7	2	1

The Daughters of Melba XV.

Melba XXV and Melba XXX are both daughters of Melba XV, both being sired by Silvermine of Darbalara, who is bred as follows:—

Silvermine (Vol. IV, No. 592), sire Trenton of Bolaro (73, Vol. I, M.S.H.B., N.S.W.); sire of sire Musket II of Bolaro (43, Vol. I, M.S.H.B., N.S.W.); dam of sire Lucky of Bolaro (389, Vol. I, M.S.H.B., N.S.W.). Dam Melba IV of Darbalara, (Vol. III, No. 1,576); sire of dam, Carbine of Darbalara; second dam, Melba of Darbalara; sire of second dam, Banker of Bolaro (Vol. I, No. 5); third dam, Madame of Bolaro (Vol. II, No. 406); sire of third dam, Heather of Bolaro (Vol. I, No. 27).

It will be seen from the above brief summary of Silvermine's pedigree that the two daughters of Melba XV are closely bred to their sire, both sides going back to Madame and Banker.

The production records put up by these two youngsters, compared age for age with those of their dam and grand-dam, are as follows:—

	Production.		Test.	Age when tested.	
	Milk.	Fat.			
	lb.	lb.	Per cent.	Yrs.	mths.
Melba VII	8,077	343	...	2	0
	7,351	297	...	3	0
Melba XV	8,844	395	4·5	2	5
	13,510	587	4·3	3	6
Melba XXV	5,843	242	4·1	2	1
	10,168	417	4·1	3	7
Melba XXX	6,897	322	4·7	2	1

Melba XVII, Vol. V, No. 1,016.

In discussing Melba XV and the strain of producers to which she belongs, it is opportune to mention the performance completed in 1923 of her herd mate and close relation, Melba XVII. This cow calved on 25th November, 1922, commenced her testing period on 29th November, and completed the period of 273 days on 29th August, 1923, and that of 365 days on 29th November, 1923. Her production for these periods was:—

	Production.		Test.	Age when test began.	
	Milk.	Fat.			
	lb.	lb.	Per cent.	Yrs.	mths
273 Days test	23,212½	911·397	3·9	6	5
365 „	29,267	1,173·784	4·0	6	5

Her performances to date are:—

	Year test began.	Production.		Test.	Age.		Period.
		Milk.	Fat.				
		lb.	lb.	Per cent.	Years.	mths.	Days.
First test ...	1919	11,717	457	3·9	3	1	273
Second „ ...	1920	12,393	471	3·8	4	2	273
Third „ ...	1921	14,064	545	3·9	5	3	273
Fourth „ ...	1922	23,212	91.	3·9	6	6	273
	1922	29,267	1,174	4·0			365

Last test completed 29th November, 1923.

This is another striking illustration of the success attained in specialised breeding.

An Appreciation.

If a skilled weaver has, say, three or four wools of different colours, he is able to make many carpets with patterns differing in accordance with the manner in which he has woven in each colour. The relationship of one carpet to another would be hard to define, for they are all of the same stock wools. So it is with the Melba family. Melba XV is of dark red colour, massively, yet beautifully, built. Melba XVII is a dark roan, but not so massive. She is one of the finest specimens of the Milking Shorthorn type that has so far been bred in Australia.

Here, under the guidance of a breeder of conspicuous ability, two distinct patterns have been obtained from the same materials, different in colour, both true to type, yet not the same, and both of the very highest production capacity, so closely line-bred that it is difficult exactly to fix their relationship to each other.

On the same estate there is still to be found the old dam of Melba XV—another 1,000 lb. butter producer, now pensioned off, looking full of years, but still showing quality at every point. All these Darbalara animals differ, yet they have a distinct family resemblance to one another.

At Darbalara there has been evolved a distinct type of Milking Shorthorn—the evolution is still proceeding, with quickened results as the breeding becomes more potent. This type is being spread to other States, too, where-ever a sire of the S.A.I. brand—special Darbalara strains—is used.

The Scottish Australian Investment Co. Ltd. have again been instrumental in bringing renown to Australia, and Mr. J. T. Cole, Manager of the Darbalara Estate and stud, has added one more achievement to his already long list of breeding feats, and has again demonstrated that in him Australia possesses the greatest breeder of dairy stock yet known. Cole and Farrer will go down to posterity as master breeders in their respective spheres—the one of cattle, the other of wheat.

It may happen to anyone to breed a freak cow that will give an abnormally high production—it is only a genius that can get high production, generation after generation, and fix the trait definitely. Mr. Cole has thus stamped himself as a genius—a breeder without compare—and Australia is proud of him, and the dairy world is indebted to him. To the recorded achievements of New South Wales, where he was born, reared, and has done all his work, he has added lustre.

It is good to acknowledge these things while Mr. Cole still lives. Mendel and Farrer received little recognition during their lifetimes—their names were given posthumous honours. It is our privilege to give Mr. Cole his due and the world to acclaim his merit while he is with us.

"Productive Swine Husbandry."

The two-fold object of the author of this work is to afford agricultural students a text book and to place before farmers a work of reference. The two lines have been well preserved, the intention evidently being to maintain the practical side as of foremost importance, and yet to provide the student with a logical and concise statement. Each chapter closes with review questions on its own subject—a feature that the ordinary reader as well as the classroom youth will find useful.

According to the author, "the man who makes money out of hogs is the man who has hogs to sell when prices are high, whose farm is never overstocked, nor yet entirely depleted of its supply. He knows how many hogs his farm will carry to advantage under average circumstances, and he practises a wise conservatism. . . . . . He may slightly expand or contract his operations at various times, but he never 'plunges.'" No attempt is made to urge the farmer to feed more hogs, and the tenor of the book is quite consistent with the quotation.

Published by J. B. Lippincott Company, London, from whom comes our copy.

The Use of Concentrated Feeding-stuffs.

W. H. PAINE, Manager, Animal Food Department of the State Abattoirs.*

WITH the advance of manufacturing industries in this country, and the consequent increase in by-products from the manufacture of oils, fats, sugar, cotton, starch, and abattoir operations, there must be an ever-increasing amount of concentrates becoming available for the use of stock feeders. In times past protein concentrates have been relatively scarce in this country as compared with America, England, and Germany, and they have, in consequence, been somewhat high in cost, but they are nevertheless of first importance to farmers in general.

Some idea of the muscular waste caused by the accomplishment of a task may be obtained by measuring the amount of carbon-dioxide given off under certain circumstances. A horse at rest only gives off 1·03 feet of carbon-dioxide per hour; while walking it gives off 1·10 feet, but a horse galloping (say, attempting to win a race) gives off 14·97 feet per hour. This serves to demonstrate the absolute importance of resting fattening stock in suitable stalls when finishing them for market, otherwise profitable gains cannot be secured. Tenderness and equal distribution of fat are secured by carbohydrates not being used upon the energy needed for movement.

The term "concentrates" needs some explanation. It means—

1. A feed composed of a portion and not the whole of any edible plant or feed.
2. Feeds which when used alone are either excessively narrow or excessively wide, and in consequence cause internal disorder.
3. By-products from some other super-concentrated product.

Linseed oil by-products have recently passed through an interesting stage, and new process linseed oil meal is now being produced in Australia. The old process of heat and pressure produces a meal of laxative properties, and more palatable than the new process, but limited in its use owing to the laxative properties mentioned. The new process meal is slightly higher in digestible protein value, and more of it can be fed per day, owing to the fact that there is less fat, and that it has a less laxative effect.

Another interesting stage will be reached when cotton by-products from locally-grown cotton make their appearance in this country. It is important that a right conception of this feed should be entertained from the commencement. Cotton seed oil meals should be yellow in colour, and nutty in odor, and the lint must be removed in order to keep down the fibre content. Dark colour is due to age, to overheating in processing, to an undue amount of

* Notes of an address at the Conference of branches of the Agricultural Bureau, Parramatta, April, 1924.

hulls, and to fermentation which frequently follows manufacture when due care in process is not exercised. It is one of the richest of protein feeds, of the uttermost value to cattlemen and to pig-raisers, but would need to be sold under a guarantee giving the fibre content and the protein ratio because it is a meal that can vary enormously in value.

Peanut meal is also making an appearance, and when free from hulls is a good feed for poultry or milking cows. The hull, however, reduces the value of the feed, having a very acid effect on the digestive system, and showing a very poor analysis. Great care should be exercised when feeding this meal to pigs, otherwise soft fat will result, and the bacon will become rancid if stored for many weeks.

The starch industry, from which gluten meal is produced, is of first importance to the dairy, beef cattle, and export lamb trade, but it is notable that the best results are obtained, and the highest digestibility secured, when this meal is fed with animal concentrates, such as meat extract or blood meals. It has been found rather unsatisfactory for pigs, but excellent for developing poultry for market.

It has been found that a combination of the proteins obtained from animal foods with those from the vegetable concentrates generally give the best effects with cattle, sheep, and pigs, but with poultry the animal protein has been proved best. Animal proteins usually give greater digestive effect to all other foods with which they are mixed, and enhance the digestible effect of vegetable proteins. They are able, too, to produce great staying power in working animals. The vegetable proteins, in addition to their valuable body-building qualities, secure correct bowel action in all classes of stock, but it is important to watch that the fat or oil content is not high in any of these by-products.

Pre-natal nutrition has an enormous but unappreciated effect on the progeny, and the quicker the maturity of the animal the more the pre-natal nutrition contributes to subsequent growth. Thus poultry is most dependent in this matter, and pigs, sheep, and cattle in that respective order.

In all classes of stock, the withholding of protein in the early stages of growth adds to the cost of securing subsequent growth and maturity.

Two methods of rearing cattle may be mentioned—(1) agistment (in which it takes three or four years to produce stock of average beef weight), and (2) stall-feeding during the second twelve months, with consequent quick fattening. Roughly speaking it can be taken that 18,000 lb. of feed is consumed by a beast two years of age, which should weigh from 800 to 900 lb., while on the other hand it takes 43,000 lb. of feed to produce the same weight over a period of four years.

What has been said in regard to pre-natal nutrition applies equally to sheep, and it is well to give some supplementary feeding to the ewe some five weeks prior to lambing. If this is done, more and stronger lambs will be secured,

and where export lambs are desired, it will be found that they will be ready for market very much earlier than those bred from ewes where supplementary feeding has not been practised.

Australia has much to learn from New Zealand in this industry. In the Dominion mob marketing does not exist as it does in Australia, but batches are taken according to their fitness each week, and those that are held on hand are specially fed to speed up their maturity for slaughter.

It is now claimed by some authorities that the use of meat concentrates prevents cannibalism among pigs, and where the sow is fed on skimmed milk with animal concentrates stronger litters result, and the pigs make better development during the subsequent stages of growth.

A breeding hen requires less protein concentrate than a laying hen, mainly because good fertility is not secured from hens that have been even slightly forced for the production of large quantities of eggs. Better feeding of market cockerels should be practised. The ration of 1 of protein to 4·5 of carbohydrates, while satisfactory for normal egg-production, is too concentrated for the finishing of market cockerels between ten and sixteen weeks. The ration could begin at 1 to 5·0, and be widened out in the last week to 1 to 6·5. Cockerels during the last ten days should be confined, in order to develop tender muscles or lean flesh, and to add body weight by the secretion of fat and semi-fat tissues.

The Renovation of a Lucerne Stand.

How best to treat a three-year-old stand of lucerne which showed signs of deterioration was the problem presented to the Department by a correspondent recently. The land might, in the writer's opinion, possibly be deficient in lime. Would it be advantageous, on the showing of the sample of soil submitted, to make an application of this constituent?

The correspondent was informed that the application of lime is not recommended, as the increased growth rarely warrants the cost. Lime usually costs about £5 per ton delivered on the farm, and it is unlikely that the increased yield will be sufficient to return a profit. In this case superphosphate could probably be applied with advantage at the rate of 1 cwt per acre early in the spring. It can be spread over the lucerne on a calm day through the fertiliser attachment of the wheat drill, the tubes being removed so that the superphosphate will be well distributed. If the weather is windy it is better to use the tubes on the drill, so that the fertiliser may be conveyed to the ground.

It is not easy to injure established lucerne, and heavy cultivations may be given. One cultivation may be given in the spring after the superphosphate has been spread, and a further cultivation after each cutting. A disc cultivator can be used for the spring cultivation, but for the later cutivations it may be better to use a spike roller or a springtooth cultivator.

It may be added that pamphlets on the top-dressing of lucerne and other aspects of the cultivation of this crop are among the many obtainable free by farmers on application to the Department.—A. H. E. McDonald, Chief Inspector of Agriculture.

Nursery Methods that Affect Profits.

O. BROOKS, Senior Fruit Inspector.

EVERY orchardist is familiar with the unprofitable, unthrifty tree, but not every orchardist connects the condition of such trees with careless treatment in some apparently trivial detail in the nursery. Yet it is not too much to say that it is often the man who handled the tree at some early stage in its life that is to blame and not the tree itself. In fact, better nursery methods would greatly reduce the number of unprofitable trees, and relieve the industry of a substantial burden.

When the amount of time that is entailed in connection with each tree in the orchard is considered, the additional time often given to poor trees in the hope of improving them, and the rental each should carry for the land occupied—when all these things are totalled, it will be found that the unprofitable tree is a very significant item indeed, and that if every such tree in the orchard were replaced by a vigorous cropper the grower's position would be appreciably better.

On the principle that prevention is better than cure, it may be profitable to go back to a few nursery errors and to indicate why and how they should be avoided. The straight path in nursery work may be said to have been indicated long since by Mr. W. J. Allen, but it may prove useful to point out a few of the pitfalls that strew the track, and to show the losses and misfortunes they occasion. We deal primarily with citrus stock, but some of the suggestions may be found applicable to other classes of trees.

The Seed-bed and the Seedlings.

A well-drained piece of land should be selected for the seed-bed, and the soil worked into a friable, fertile condition during the winter, a little sand and manure being used if necessary to open up the soil and increase fertility.

The usual practice in this State is to use seed from the common lemon for raising seedling stocks. It seems to do well on all classes of soil and is a greater forager than many other stocks. It has generally been thought that the common seedling orange stock is best under irrigation conditions, but it is more difficult to get the buds to "take," and is about one year in five slower in coming to maturity. Another stock now being extensively used in America is the "sour orange stock," and it might be tried with advantage on our sour coastal lands and also on our irrigation areas. One or two nurserymen in New South Wales have recently obtained seed and successfully raised stocks and budded them. It grows into a very big tree, and seems to do well on low-lying, wet ground, and therefore might be found useful on wet coastal lands and on irrigation areas. "Sour orange

stock" must not be confused with the Seville or bitter orange, grown here commercially. The latter has given good results in some countries, but here it has proved a complete failure as a stock.

Seed should be only taken from ripe fruit, and seems to germinate much better if allowed to dry with its own juice unremoved.

The seed is broadcasted by hand over the bed in the spring, and then covered with soil to a depth of about 1 inch.

In five or six weeks the young seedlings are up, and it becomes necessary to provide shelter from the sun. This is usually done by erecting a frame 5 to 6 feet high, and lightly covering in the top with ti-tree shrub or similar material, but without closing in the sides.

Discourage Tap-rooting.

Under these conditions the seedlings grow for twelve months or so, and in the spring following the sowing they are ready to be transferred to the nursery bed. The site for this, like that for the original seed-bed, should be well-drained, and the soil should be prepared by a light surface working only. This is no doubt contrary to what might be expected, but the point is of importance. If the soil is deeply worked the roots of the seedling trees strike downwards and form tap-roots, and tap-rooted plants, though growing rapidly in the nursery bed, do not do well after they have been worked in the nursery and planted out in the orchard. What is wanted—and what the experienced orchardist looks out for—is nursery stock with root systems that branch just below the surface and form vigorous fibrous roots that are capable of taking up plenty of moisture and plant-food. Tap-rooted trees are scantily supplied with the fibrous roots that are necessary to vigorous growth.

The method, then, of preventing tap-rooting is to work the surface soil only and thus by having firm soil beneath, to force the roots to spread out while they are still young and tender. It is consistent with this method of preparing the nursery bed that the cultivation of the soil while the young plants are growing shall also be quite shallow—but of that more later on.

Transplanting to the Nursery.

From the seed-beds the seedlings are planted in the nursery in rows 3 feet apart, and 8 to 9 inches apart in the rows. It is essential to the best results that the roots shall be well spread out. Knots or twists in the tender roots check the flow of sap and prevent the free vigorous growth of the tree. It is not too much to say that 25 per cent. of seedlings are planted out anyway in the nursery, the roots being allowed to be kinked and crooked, with the result that they become misshapen and knotted. Many an orchardist has wondered what is the matter with a tree that does not thrive like the rest of the same planting, and it is certain that in a large proportion of cases the cause is careless transplanting in this respect. No doubt many trees planted quite carelessly grow all right, but the proportion of failures in the nursery and of disappointments in the orchard is larger than it need be.

A good method is to open a shallow furrow or a double furrow (one thrown outward each way in the nursery bed), and then to plant the young stock along the furrow, carefully combing out the roots, if need be over a cone. No doubt there is work in it, but a tree is planted to last for many years, and can only be profitable if it is encouraged to form a good rooting system from the beginning.

The method adopted by many nurserymen is to throw out a trench with a spade, leaving a straight hard bank on one side. Against this bank the young seedlings are thrown and the soil is turned or raked in so as to cover the roots. The disadvantages of the system are obvious. In addition to the possibility of the roots becoming twisted and kinked in the process of covering, there is the firm soil on one side and the loose soil on the other, with the consequent tendency of the young trees to grow more freely on the side of the loose soil than of the firm soil, and therefore to become unshapely and less vigorous than they might be.

Many nurserymen give a light dressing of bonedust—say, about 2 cwt. per acre—just after the seedlings have been planted out in the nursery, and follow it up with other similar applications at intervals until the young trees are ready for planting out in the orchard. The object of this manurial treatment is not only to stimulate growth, but to keep the roots near the surface and to encourage the formation of a strong fibrous rooting system by supplying the surface soil with plenty of plant-food.

What to Avoid in Budding.

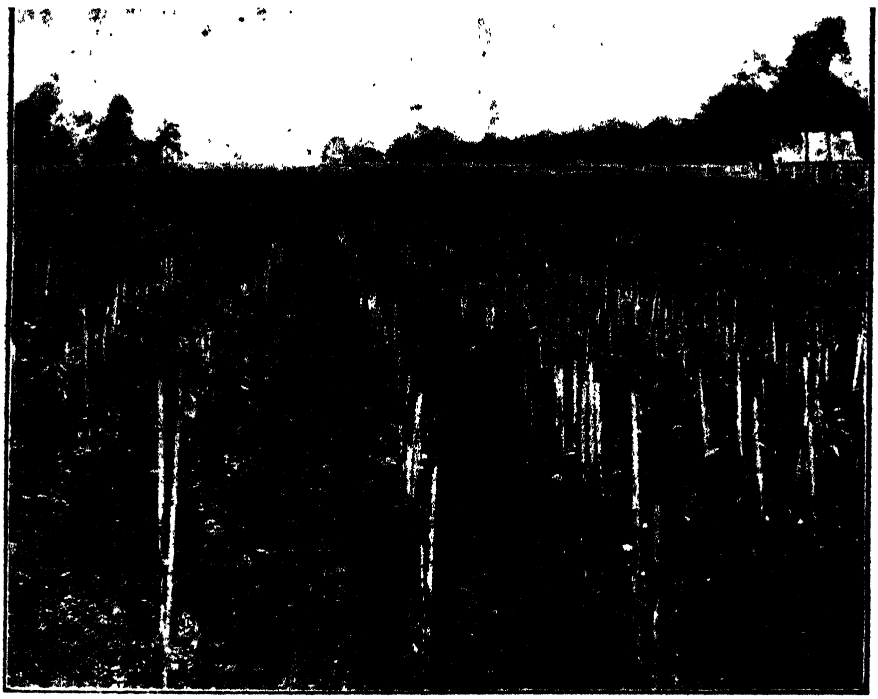
In the autumn or spring following the setting out in the nursery many of the young stock should be ready to bud.

Only well-matured wood should be used. For autumn budding the previous spring growth is generally used, and for spring budding well-matured wood of the previous summer's growth. A good deal depends upon the weather, of course, for in a dry summer the growth will not be strong, and the wood is therefore unsuitable for budding purposes.

Autumn budding is generally favoured because it is possible if some buds fail, to re-work the stocks in the spring, and in a good season the later working will almost catch up to the previous autumn's.

It is the practice of some nurserymen to continue to bud into stocks even after two or three buds have failed, but it is most unprofitable to the orchardist and should be discouraged. No doubt there is a strong temptation to make use of young stocks that still appear quite healthy. A poor "take" may be obtained from an autumn budding, and in the spring a cold night or a spell of wet weather may follow the working, and again there is a disappointing result. What more natural than that a further attempt should be made to turn the stocks to account in the following autumn or spring? The trees obtained under such conditions, however, rarely mature into good commercial assets. To ensure maximum success in nursery work —and nothing less will do in these keen days—everything must be succulent and free growing, and anything not answering to that description should be absolutely discarded.

One method, which is only applicable to coastal districts, and which in favourable seasons is successfully adopted by a few nurserymen, is to plant seed about November, transplanting the seedlings the following spring and budding in December. If the weather conditions are suitable the buds "take" and start to shoot quickly, making very rapid growth. Light applications of bonedust and sulphate of ammonia are given to the trees, creating a strong fibrous root system, and sometimes resulting in the young trees being so far forward that they can be transplanted early in the autumn. If not ready quite so soon, they are available, of course, for transplanting in the spring. The method tends to produce a well-rooted little tree, which makes up very rapidly when transferred to the orchard.



Nursery Stocks Properly Staked.

What Selecting Budding Wood Means.

Orchardists have begun to realise in recent years the value of selecting the budding wood from trees known to be good bearers—and not irregularly so; they should be known to be regular bearers over a number of years. Many of our best varieties of citrus fruit are beginning to show signs of deterioration and "running-out," apparently the result of continual interworking on to lemon stocks. What is required is that for budding wood we should go back to trees true to type of the original varieties. Valencia Late and Washington Navel—both valuable varieties—exhibit tendencies

to run out, and only resort to trees of good, vigorous bearing habit and true to type will save them for growers. The necessity appears to be the greater because of the continual use of the lemon stock. Were the seedling orange stock more extensively used there would perhaps be less trouble in this respect. Meantime it would be well worth orchardists' while to pay pounds per hundred more for trees known to be properly worked in this respect than for inferior sorts.

It is a good practice to insert the bud, say, 2 or 3 inches above the ground level. The union of scion and stock is the part of the tree most liable to diseases like collar rot, and if the bud is a bit high it is easier to ensure a good clearance when planting out. If the union is covered when planting out takes eplace, and is kept covered in the subsequent cultivations, the tree seems to smother and never makes the vigorous growth that produces a good bearer.

In coastal districts in particular, shallow planting is an advantage because cultivation tends to work the soil up to the tree and therefore to cover the union.

Whether a little bit of wood should be left in the bud in taking the bud from the stock is much discussed, but on the whole there seems to be some advantage in leaving a thin shaving. Among other things it seems to prevent the tendency for the bud to split on the inside when brought under pressure in inserting and tying in place on the stock.

Subsequent Treatment in Nursery Bed and Orchard.

Heading is always done in the spring as soon as it is apparent that the bud has taken and is starting to shoot. Some nurserymen when cutting the stock back after the bud has shot leave quite a stub above the bud, but in time this dies off and not only prevents the bark from spreading over and covering the whole surface, but tends to produce an unshapely tree. It is much better to make the cut fairly close to the bud, and not straight across, but at a slight angle, so that there is as little wood as possible to die off. A good sharp tool should be used, so that the bark shall not be bruised or injured in any way.

As soon as heading has been done, each stock should be staked with stakes half an inch square and, say, 3 feet long. As the shoot grows it must be tied to the stake to prevent it from being torn or blown out.

Throughout the growing period of the young tree disbudding must be carried on regularly. It is again essential that the implement be sharp, so that the wound may be a clean, smooth one that will heal well. If the buds are rubbed off, as many nurserymen do, a rough callous surface is formed and the vigour of the tree suffers the more. Orchards have been seen to grow into a very scraggy-looking lot of trees, and examination suggested strongly that this rubbing off was one of the material causes for unthriftiness.

When two shoots develop from one bud, as sometimes happens, only one should be left. The practice of some nurserymen of allowing the second shoot to grow in order that it may provide budding wood is a very bad one, and is probably one phase in the deterioration of certain useful varieties.

Finally, in connection with the transfer from the nursery bed to the orchard, as much as possible of the fibrous roots of the little tree should be lifted. Many failures are due to careless lifting, and many more to careless planting. The suggestions made above about the combing out of the roots so as to avoid knots and kinks are again applicable, and their adoption will contribute materially to the profit-earning capacity of the orchard. Where the roots run in layers, each layer should be carefully separated and covered with soil, one at a time.

To some growers a good deal of the foregoing no doubt appears to be unnecessary, but the successful establishment of an orchard—like the establishment of any other business that is to produce maximum returns—depends upon a proper appreciation of many details, each of which contributes in its measure to the efficiency of the whole, and each of which is therefore worth the careful attention of the proprietor.

An Interesting Milk Record.

The time it may take a cow to mature and show her quality as a milker is strikingly emphasised in a record published in a recent issue of the *Journal of the Ministry of Agriculture,* London. The animal (a non-pedigree Shorthorn) had been retained by her owner, contrary to his usual practice of selling cows when carrying their third or fourth calf, in order to test a remark which he had heard concerning the cow's sire, to the effect that the longer the progeny of this bull were kept the better milkers they would be.

The following annual and lactation yields confirm the accuracy of this remark :—

	Days in Milk.	Milk Yield (lb.)
Year ended 1st October, 1918	274	5,759
,, ,, ,, 1919	256	6,370
,, ,, ,, 1920	172	6,695
,, ,, ,, 1921	246	5,745
,, ,, ,, 1922	340	17,897
,, ,, ,, 1923	220	12,857
Period from 1st October, 1923, to 3rd February, 1924	136	7,271
2nd lactation, calf born 13th April, 1918	244	5,382
3rd ,, ,, 1st April, 1919	235	6,282
4th ,, ,, 3rd June, 1920	362	11,097
5th ,, ,, 22nd Oct., 1921	424	19,066
6th ,, ,, 13th May, 1923*	273	18,960

* This last yield was up to 3rd February, 1924, when she was still in milk and giving about 40 lb. per day.

As will be seen from these returns the cow gave little promise in her early years of being a big milker. At the time of inspection she was reported to be in splendid condition and perfectly healthy, and was expected to pass the 2,000 gallon mark. It is stated that the owner has four other cows from the same sire which have all averaged over 1,000 gallons with their last four calves.

Poultry Notes.

July.

JAMES HADLINGTON, Poultry Expert.

HATCHING and rearing should now be well under way, and the success or failure of a farm will largely depend upon the character of the work done during the next two months.

The advisability of spreading the hatching season over three or four months was commented upon in last month's notes. While this advice is the outcome of years of practical experience there are those who are attempting two extremes which depart from it. On the one hand there is the idea that hatching and rearing should be carried on almost the whole of the year round, and, on the other hand, there are those who think that the object should be to bring out the required number of chickens in the shortest possible time, and have done with the rearing season. The one extreme is almost as bad as the other, and both are very faulty. The devotees of both extremes are mostly either those with but little experience or the restless spirits who are for ever seeking change, forgetful of the fact that nature does not change perceptibly over long periods of time.

The middle course of spreading the hatching and rearing season over the late winter and spring months, say, June to September, has recently been styled the "Hadlington season," though why, I am at a loss to understand, because it is a general and universal experience that these months are the proper hatching and rearing season. But we may deal with these extremes in detail.

Continuous Rearing.

Hatching at all seasons of the year, or even during the greater part of it, is productive of a whole batch of chicken troubles. For instance, it is a common experience that chickens do better on new ground than on land that has become stale and foul from continuous batches run over it; hence the advice frequently given in these notes to rest the land over which chickens are to be run. This and the climatic conditions prevailing at other times of the year, together with the fact of the moulting season, during which breeding operations are undesirable, constitute reasons why hatching on any considerable scale should not be carried on outside of certain months.

It is no good to tell us that there are fancy prices awaiting the cockerel portion ot our output during certain months if in striving for those fancy prices we ruin all prospects of successful rearing in the months when the great bulk of chickens must be reared. The fact is that all chickens hatched between the months of September and June should be treated as catch crops, and the advisability of hatching should be based upon facilities being available for (a) obtaining good hatchable eggs, and (b) rearing on ground

not required in the spring The difficulty in this connection is that while hatching and rearing a few chickens at any time is more or less practicable with the general farmer and the back-yarder, it is quite a different proposition on the commercial farm where the plant for handling large numbers cannot be moved on to fresh ground.

These considerations, however, may not altogether prohibit a short hatching season commencing with the putting down of eggs in January and lasting through February, using only portion of the rearing plant and closing down in time to give the rearing ground used at this time a spell of three months or over before the spring hatching.

On many farms even this would be inadvisable, because while we may run adult stock over the same ground almost indefinitely without spelling, to do the same thing with chickens is to court disaster. From June till the end of the spring hatching season is quite long enough to have the plant and ground occupied by chickens without a rest. It is a very common experience that the latest batches of chickens hatched towards the end of September do not make anything like the same growth as those hatched even two weeks earlier.

"Splashing."

We turn now to the opposite idea, viz., that it is better to make a splash in hatching or to purchase day-old chickens, and to have all rearing over inside of a couple of months (or of one month if possible) and to shut down for the remainder of the year. This practice is also productive of trouble.

The first drawback is that to carry it out successfully double the rearing plant and equipment is required to put through double the number of chickens in so short a time. When it is considered that the rearing plant is by far the most expensive accommodation on the farm, it will be seen that, firstly, such a practice is not economical, and, secondly, but few farms in the State have sufficient rearing plant to handle so many chickens at one time. What follows then, is an endeavour to run far too many chickens in the batches, and, no matter how or under what system, this practice leads to loss of size (in other words, to poor development), and a whole train of troubles, including losses from disease, and a falling off in the productive capacity of the resultant pullets. "Splashing" is productive of erratic results in any business. In poultry-farming it usually proves disastrous to persons of average capacity and slender resources.

Unfortunately, in the case of some it is not possible to save them from their folly, and when disaster overtakes them they seek to invoke the aid of science to find out the cause of their trouble. Science can do little or nothing to alleviate the consequences arising from a violation of the laws of nature, and if chickens are not kept under conditions suited to them nothing will avert the penalty attaching to such errors. Poultry-farmers are keen on invoking the aid of science to enlighten them as to how to secure

higher egg-production and to fight disease, while their methods in other respects are sapping the foundation of the very thing they seek to build up.

We might well adopt the motto: "Secure good rearing and all things will be added."

Information Obtainable.

On the question of scientific research work in the interests of the poultry industry, I undertook, at the recent Poultry Farmers' Conference, to place before that assemblage a resumé of the work now in progress at Hawkesbury Agricultural College.

It would appear that comparatively few poultry-farmers were aware that the Department was carrying out important work other than running a poultry section and an egg-laying competition. In going through the applications for tickets to the conference it was obvious that many small poultry-farmers were desirous of attending the conference with a view to gaining information in connection with their every-day work on the farm. Unfortunately, provision could only be made for 600 visitors, and in consequence many applications had to be refused. However, those who have had to be refused in this way have been informed that they can visit the College for the purpose of gaining information.

Hundreds of poultry-keepers and intending poultry-farmers appear to be unaware of the information available to them, and it may be of advantage to many to know that they can visit the College any Thursday (which is visitors' day) or, in particular cases, on other days by appointment, if application is made to the Principal, Mr. E. A. Southee.

The Hon. the Minister for Agriculture, Mr. F. A. Chaffey, desires it to be known that, in addition to the facilities offered at the College, the Government Poultry Farm at Seven Hills may be visited any day other than Sundays and holidays for the purpose of gaining information on the actual work of poultry-farming, and that this farm, as well as all poultry activities of the Department, is under the direction of the Poultry Expert. Inquiries for information by letter, if addressed to the Under Secretary and Director, Department of Agriculture, will receive attention.

Government Poultry Farm Equipment.

For the information of poultry-farmers, it might be stated that in addition to the larger operations with mammoth incubator, hot water circulation brooders, &c., a smaller equipment has recently been installed with the object of demonstrating other methods of brooding, from the setting of a broody hen and onwards. Hover brooders over hot pipes, and cold brooders have been installed, and can be seen in operation.

In this connection an explanation is necessary, owing to some false statements having been made to the effect that the brooding system has been changed. No change of system has taken place so far as the work of the farm rearing is concerned, nor is any contemplated, for the simple reason that the present system gives better results than any other that is known. The

additional installations are the result of a recognition that there are other systems of brooding, and a small number of units have been put in for demonstration purposes only, principally with a view to assisting the poultry farmer who may not be able to put in a more pretentious plant.

The next few months will be a good time to see chicken-rearing in full swing.

Mixing the Morning Mash.

The writer, when visiting farms, has been somewhat surprised to find that quite a large number of farmers make so much hard work of mixing the morning mash. In this, as in most things, there is a right and a wrong way, also a laborious way and an easy way. To mix up a mass of pollard, bran, and the other constituents of the mash dry, and then wet it, is not only the most laborious method but it scarcely ever results in a mash of the right consistency; on the other hand, it often produces a sticky mass.

The more simple and easier way is to place the pollard round the tub, or in the case of a proper mixing trough, at each end, and then to put the bran with the meat meal or other concentrates in the depression in the middle. Over this pour the hot water or whatever liquid is used. The bran and concentrates, being the coarser and least sticky bodies, can be stirred up into a wet mash like porridge. When well mixed the pollard should be gradually introduced and worked up with the hands, or in the case of a large quantity with some tool. A four-pronged hoe or an ordinary garden four-pronged fork are excellent tools for mixing up to a point, and then the mixing should be finished off with the hands. In this way one man can mix sufficient to feed 1,000 adult birds in less than half an hour, and the mash will be superior to one where the ingredients are mixed before wetting. Try it.

Grain Silos for the Farm.

The types and approximate costs of silos that may be used for the conservation of grain as stock feed on the farm was a recent subject of inquiry by a farmer. He contemplated erecting a mouse-proof silo capable of storing some 2,000 to 3,000 bags of oats.

A silo to hold 3,000 bags, or 9,000 bushels, of oats should have a diameter of about 20 feet and a height of 38 feet, and the most effective type is constructed of reinforced concrete, on the lines of the wheat silos erected at country railway stations. The approximate cost of such a silo would be £550.

Another method is to erect on strong timber stands separate storage tanks made of 22-guage galvanised corrugated iron, each holding 600 bushels, with a diameter and height of 10 feet. The cost of fifteen of these tanks erected would be about £450.

Yet another method would be to erect a mouse-proof barn. The walls of this should be constructed of round posts set into the ground and covered on the inside with corrugated iron fixed horizontally to the posts. The floor, if on the ground, should be of concrete; if raised, it may be of timber. Such a shed could be erected for £320.

Grain could be stored with safety in any of the receptacles described.—A. Brooks, Works Superintendent.

A Canker of Apple Trees.

Due to a Fungus, *Dothiorella mali*, E. & E.

W. A. BIRMINGHAM, Assistant Biologist.

During the period 1916 to 1922 four cases of canker in apple wood were met with, due to a fungus *Dothiorella* sp. (Fig. 1, *a* and *b*). The author has been unable to find any previous record of a *Dothiorella* causing a canker of apple trees in Australia.

(*a*) (*b*)

Fig. 1.—Cankers on Apple Trees, due to *Diothiorella mali*.
(*a*) Branch from apple tree at Killara, July, 1922.
(*b*) Cankers on Granny Smith apple trees.

Specimens were examined from Narara in July, 1916, and the spores were found to be colourless, elongated, elliptical and inclined to be pointed in some cases. They measured 20 to 24 by 6·0 to 6·6 microns.* Material from Ashfield in August, 1916, showed similar spores, but the measurements differed slightly, being 14 to 20 by 5 to 6 microns. Cankered wood from

* 1 micron equals one twenty-five thousandth part of an inch.

Killara in July, 1922, gave spores of similar structure, measuring 16 to 21 by 5 to 6·6 microns. From Windsor in December, 1922, the spores were similar to the preceding cases, and the measurements 18 to 24 by 4 to 6 microns.

Cultures on potato-dextrose agar produced a rapid growth in four days, giving a cotton wool-like aerial growth, with traces of dark-green filaments. At the end of twenty days the aerial growth in the lower part of the tube had become smoke-coloured, while that at the top of the tube was composed

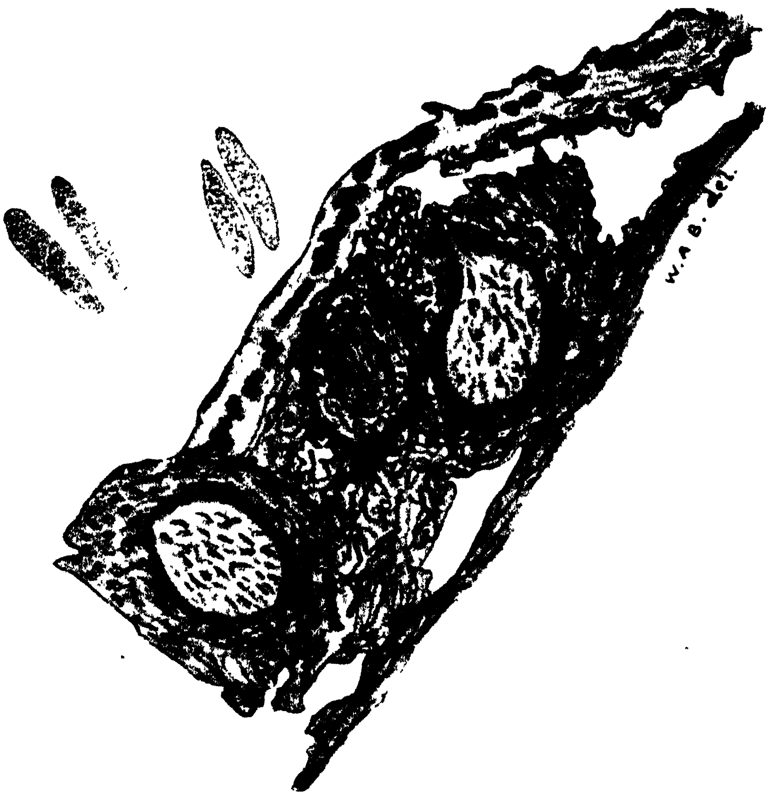


Fig. 2.—Camera lucida drawing of section through pycnidia.

of white filaments. Hyphae extending up from a compact black mycelial growth on the surface of the medium were greenish-black in colour. Those which had penetrated into the medium forming a more or less dense growth, were lighter green in colour, with a bluish tinge.

No spore development took place. The growth was subcultured on apple bark extract agar with the same result. Even in old cultures where the food supply had been almost exhausted, no indication of spore development was detected.

An apple tree was selected at Kogarah for inoculation purposes. One branch had four cuts made in the bark, into two of which a mass culture of

the fungus was placed, the remaining two branches being left as controls. All of the cuts were bandaged with moist cotton wool for two days, when the bandages were removed.

The tree was examined a few months after inoculation, and it was found that two large cankered areas had developed from the injuries in which the fungus had been placed, while no cankers had formed from the other two cuts. Spores from these cankered areas were identical with those found in the original material, the spore measurements ranging from 13 to 18 by 5 to 7 microns.

The camera lucida drawing and Fig. 3 show sections through pycnidia (spore-cases) and the spores within from the cankers produced at Kogarah. Cultures were made from the Kogarah cankers, and a fungus identical with that used for inoculation purposes was secured. The fungus has been repeatedy subcultured, but no spore form has so far been observed.

Fig. 3.—Sections through Spore Cases.

Dothiorella mali E. and E., has been recorded in the literature cited below on dead apple limbs at (Cuba) Illinois, May, 1893.

The characteristics of the fungus associated with cankers on apple limbs in New South Wales compare sufficiently well with those of *D. mali* to provisionally place it as *Dothiorella mali* E. and E.

No experiments have been carried out for the control of the cankers, but it is reasonable to expect that equally good results will be obtained by adopting the method generally recommended for the treatment of cankered areas due to fungi. This treatment consists of removing all diseased canker well beyond the affected area with a sharp knife or chisel, burning the diseased material, and treating the cut surface with Bordeaux paste (for preparation of which see Spray Leaflet No. 1). In any case where a limb is girdled by the canker, it will be necessary to remove and burn it.

I am indebted to Mr. W. J. Reay for the photographs accompanying this paper.

Literature Cited.

1. Proc. Acad. Nat. Sci. Philadelphia, 1893, p. 456.
2. Sacc. Syll. Fung. Vol. XI, p. 504.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1924:—

Description.	Imports.	Exports.	Description.	Country of Origin.	Imports.	Exports.
Interstate.	Cases.	Cases.	*Oversea.*			
Fresh Fruit ...	613,529	95,779	Fresh Fruit—		Centals.	Centals.
Pineapples ...	......	...	Citrus	... .	9,118	69
Melons ...	...	...	Apples ..	....	......	898
	lb.	lb.	Pears	....	... ..	1,363
Canned Fruit ..	49,504	1,820	Pineapples ...	.. ..	......	1,764
Dried Fruit—			Bananas ...	....	180	...
Unspecified ...	11,340	588	Other	....	78	1,518
Currants ..	7,644	448	Dried Fruit—			
Raisins ..	8,232	...	Apples, Pears,		lb.	lb.
Apricots ...	532	...	Peaches, &c..	U.S.A.	3,710	...
Apples ...	1,624	...	Apples ...	....	.. ...	615
Prunes ..	784	...	Apricots ...	....	......	208
Pears	168	...	Currants .	....	......	2,500
Sultanas ..	2,100	...	Prunes ...	France	1,960	1,062
Peaches .	644	...		U.S.A.	92,655	...
			Peaches ...	....	......	264
			Raisins—			
			Sultanas ...	Turkey	497	4,776
				Syria	31	...
			Lexias ...	....	......	501
			Other ...	Commonwealth..	132	1,256
				U.S.A.	170	...
			Dates	Mesopotamia ...	927,824	58,365
			Other	United Kingdom	3,923	3,227
				China	11,429	...
				France	2,315	...
				Greece	1,256	...
				Turkey	8,751	...
				U.S.A.	4,714	...
				Egypt	1,000	...
				Spain	110	...

Empire Trade in Fruit.

The Agent-General for New South Wales in London has forwarded to the Department for free distribution amongst fruitgrowers a number of copies of the Empire Exhibition and Trade number of *The Fruit-Grower.*

The more interesting articles in this issue deal with the overseas displays at the British Empire Exhibition, the special handling and distributing facilities of the fruit ports of Great Britain, recommendations from the Imperial Economic Conference held in London regarding the development of fruitgrowing within the Empire, a short note on the transport of fresh fruit, and a *résumé* of the standard grades and packages under the Canadian Fruit Act, 1923.

Growers can obtain copies by applying to the Under Secretary and Director, Department of Agriculture, Box 36, G. P. O., Sydney.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize :—	
Craig Mitchell ...	K. W. D. Humphries, Muswellbrook.
Early Morn ...	H. S. King, Llangothlin.
Fitzroy ...	Manager, Experiment Farm, Grafton.
	A. M. Hooke, Taree.
Funk's Yellow Dent ...	N. C. Pyemont, "Moondana," Gundagai.
Golden Beauty ...	A. M. Hooke, Taree.
Hickory King ...	J. Campbell, Wingham.
Large Red Hogan ...	G. E. Levick, Taree.
Leaming ...	Manager, Experiment Farm, Grafton.
Manning Silvermine ...	H. E. Smart, "Purfleet," Taree.
Pride of Hawkesbury ...	Dempsey Bros, Taree.
Sundown...	J. S. Whan, Llangothlin.
Wellingrove ...	Manager, Experiment Farm, Glen Innes.
Millet :—	
Hungarian ...	Manager, Experiment Farm, Yanco.
Japanese ...	Manager, Experiment Farm, Coonamble.
Sorghum :—	
Collier ...	Manager, Experiment Farm, Grafton.
Early Amber Cane ...	Manager, Experiment Farm, Bathurst.
Feterita ...	Manager, Experiment Farm, Coonamble.
Kaoliang ...	Manager, Experiment Farm, Bathurst.
Selection, No. 34 ...	Manager, Experiment Farm, Yanco.
,, No. 61 ...	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Berry.
Sudan Grass :—	
Sudan Grass ...	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Coonamble.
	Manager, Experiment Farm, Temora.
Grass :—	
Wimmera Rye ...	Manager, Experiment Farm, Temora.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Orchard Notes.

July.

W. J. ALLEN and W. LE GAY BRERETON.

Pruning.

In many cases the deciduous fruitgrower will still be busy pruning. It is not proposed to repeat instructions in these notes, as a leaflet on the subject is obtainable free of cost, and a new edition of the larger work "Pruning," which goes into greater detail, may be obtained from the Department for the sum of 3s. 3d., post free.

A reminder may be given, however, that in handling strong, upright growers a greater spread can be gained in the main framework by leaving some temporary centre to the tree while it is being developed. Later, when this temporary centre is removed, a wide-based tree is left. This method of spreading should only be used on trees that are making very strong growth, and that can support the temporary centre and at the same time develop the outside permanent framework satisfactorily. Care must be taken that the temporary growths left in the centre are not too strong, or they may take charge and stunt the development of the outside framework, thus frustrating the object aimed at. To assist in guarding against this the trees should be looked over during spring and early summer, and these temporary shoots checked if necessary during the growing period. Care should also be taken that the temporary centre is not too dense, or it will shade and thereby prevent the development of fruiting wood on the inside of the permanent main limbs.

There is an objection to using the foregoing method of spreading in apple trees liable to woolly aphis, as the removal of the temporary centre later leaves a wound which takes some time to heal over, and during that time the callous affords a breeding ground for the aphis.

The method of cutting the leaders to a bud above the outer one required while young trees are being developed should also be employed on strong, upright growers. This method also entails looking over the trees during the growing period, as sometimes the uppermost shoot will sap the desired shoot below.

Spreaders, or struts, placed between limbs across the tree can be employed to give an outward tendency. This work takes a fair amount of time, but often saves cutting by getting the desired form and allowing trees to be left untopped at an earlier period than could otherwise be done.

Planting Deciduous Trees.

July is a good time for planting deciduous fruit trees where it has not been done earlier, and the rains that fell in many parts during June should have put the ground in good order. The soil should be moist for this work, but not

too wet, or it will become badly pugged by the necessary trampling in of the soil around the roots. The roots of the young trees should be examined before planting, and any damaged parts trimmed away. If any galls are found that cause suspicions of crown gall, &c., the tree should be discarded and burnt, as in planting such trees there is danger of introducing the disease into the orchard and losing many trees already developed.

The centre of the hole in which a tree is to be planted should be high, so that the roots can be spread with a downward tendency. The greatest care should be taken to tramp the soil thoroughly in round the roots as the hole is filled. The last soil to go in to fill the top of the hole can be left loose to check evaporation.

Diseases and Pests.

Peach tip moth has not, so far, become established in the inland and tableland districts, and it is to be hoped that the conditions in those districts are unfavourable to the pest, and that it will not become acclimatised to them. But there is no certainty that this is the case, and growers putting out fresh deciduous trees should, as far as possible, obtain them from clean districts. If this be not possible, all introduced trees should be very carefully examined, and any larvæ or pupæ adhering to the bark, destroyed. All parts cut from the tree or any packing they came in should be burnt.

All young trees should be examined during the spring and early summer for the first couple of seasons after planting, and any tips that have been attacked removed and destroyed before the grubs have left them. Though this pest prefers the peach and nectarine trees it also attacks plum trees, and the later broods will attack the fruit of the apple and quince.

Peach and nectarine trees should be sprayed with lime-sulphur (winter strength) or Bordeaux mixture, 6–6–40, this month to protect them against the attack of peach leaf curl.

Cultivation.

If the orchard has not received an autumn ploughing, the winter ploughing should be completed by the end of the month, in order to catch and store what rain falls between then and the spring. If the ground is dry enough, stable manure can be carted out to any weak trees.

In America the consumer knows what he is entitled to get when he asks for milk. According to a writer in the *Scottish Journal of Agriculture*, the question of the legal limit of 3 per cent. of butter-fat does not arise. The consumer merely looks at the bottle in which the milk is retailed and notes the depth of the cream, and immediately makes up his mind accordingly. A retailer attempting to sell 3 per cent. milk would quickly close down.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Wentworth P. A. and I. Society	W. B. Crang	July 16, 17
Peak Hill P. and A. Society	T. Jackson	,, 29, 30
Condobolin P. & A. Society	J. Carter	Aug. 5, 6
Bogan Gate P. and A. Society	J. Egan	,, 12
Trundle P. and A. Society	W. A. Tolmie	,, 14, 15
Parkes P. A. and H. Association	L. S. Seaborn	,, 19, 20
Illabo P. A. and I. Society	J. M. Hamilton	,, 20
Forbes P. A. & H. Association	W. T. Gilchrist	,, 25, 26, 27
Gunnedah P. A. and H. Association	M. C. Tweedie	,, 26, 27, 28
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	,, 26, 27, 28
Grenfell P. A. & H. Association	Geo. Cousins	Sept. 2, 3
Cootamundra A. P. H. & I. Association	W. W. Brunton	,, 2, 3
Manildra P. and A. Society	J. Longley	,, 9, 10
Culcairn P. A. H. and I. Society	A. J. Ralph	,, 9, 10
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Northern A. Association (Singleton)	J. D. Guffils	,, 10, 11, 12
Ganmain A. & P. Association	A. R Lhuede	,, 16, 17
Cowra P. A. and H Association	E. Todhunter	,, 16, 17
Temora P. A. H. & I. Association	A. D. Ness	,, 16, 17, 18
Junee P. A. and I. Society	T. C. Humphrys	,, 23, 24
Canowindra P. A. and H. Association	J. T. Rue	,, 23, 24
Murrumburrah P. A. and I. Association	W. Worner	,, 23, 24
West Wyalong P. A. H. and I. Association	T. A. Smith	,, 23, 24, 25
Burrowa P. A. and H. Association	W. Burns	,, 25, 26
Barmedman A. and H. Society	T. P. Meagher	Oct. 1
Ardlethan A. Society	R. L. Neill	,, 1
Hay P. and A. Association	C. L. Lincolne	,, 1, 2
Corowa P. A. and H. Society	J. D. Fraser	,, 3, 4
Berrigan A. and H. Society	R. Wardrop	,, 7
Narandera P. & A. Association	W. H. Canton	,, 7, 8
Ariah Park A. Society	J. F. McInnes	,, 8
Deniliquin P. and A. Society	P. Fagan	,, 15
Griffith A. Society	M. E. Sellin	, 15, 16
Lismore A. and I. Society	H. Pritchard	Nov. 18, 19, 20

1925.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 9, 10
Dapto A. and H. Society	E. G. Coghlan	,, 16, 17
Kiama A. Society	G. A. Somerville	,, 24, 26
Wollongong A. H. and I. Association	W. J. Cochrane	,, 29, 30, 31
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	Feb. 13, 14
Guyra P. and A. Association	P. N. Stevenson	,, 17, 18, 19
Newcastle A. H. and I. Association	E. J. Dann	,, 24 to 28
Blacktown A. Society	J. McMurtrie	,, 27, 28
Berrima A. H. and I. Society (Moss Vale)	W. Holt	Mar. 5, 6, 7

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Agricultural Gazette of New South Wales.

Fallowing in Central Western Districts.

H. BARTLETT, Senior Agricultural Instructor.

FALLOWING has been correctly termed the basis of successful wheat growing, and the system has been largely responsible for the extension of our wheat areas, and also for an increase in the yield per acre. The general principles of fallowing are applicable to every portion of the State, and in the past, owing to the wide range of soils and climatic conditions embraced in each instructor's district, it has been possible to advise as to the working of fallows only in general terms, the advice always being qualified with the statement that cultivations must vary according to soils and climatic conditions. Having been stationed in the western district for the past three and a half years, with a territory that has a radius of 50 miles—the whole of the time being devoted to the study of wheat-growing, while the task of judging many crop and fallow competitions has presented opportunities for the close observation of different soil types under varying farming methods—the writer feels that certain recommendations and suggestions may be made for the guidance of farmers when preparing seed-beds.

The district embraces the towns of Parkes, Peak Hill, Forbes, Bogan Gate, and Trundle, situated partly on the Central-western Slopes and partly on the Central-western Plains.

Climate.

The altitude ranges from 770 feet above sea level at Bogan Gate to 1,035 feet at Parkes. During the summer period the day temperatures are generally warm to hot, and the night temperatures cool, and in the winter light frosts and warm days are the rule Taking Parkes as the centre of the district, the records of thirty-two years until 1921 show the extreme maximum shade temperature of 109 deg. Fah., and a minimum of 27 deg. Fah. The earliest recorded frost occurred on 28th April, and the latest on 2nd October.

The average annual rainfall for the period was 20.92 inches, and the average monthly rainfall was as follows:—

	inches.		inches.
January	2·16	July	1·80
February	1·29	August	1·92
March	1·84	September	1·70
April	1·52	October	1·59
May	1·65	November	1·31
June	2·19	December	1·95

The average incidence of the rainfall for the winter period (May-October) was 10·85 inches, and for the summer period (November–April) 10.07 inches—almost equal.

Although the average monthly rainfall is remarkably uniform, the general experience, on account of temperature and evaporation, is that the months

of November, December, and early January are usually dry. Tropical storms are expected late in January and in February. March, April, and May are months of light rainfall. In May there is a gradual change from the tropical to the Antarctic centre of disturbance, and the months of June, July, and August are usually noted for steady and prolonged rains. In September and October the rainfall lightens, and changes over to the tropical centre in November.

The application of this knowledge in the working of fallows suggests that the land should be in such a condition in the months of June, July, and August as will allow of the greatest penetration of moisture to the subsoil; in fact, it should be in a rough condition as left by the plough. In September and October steps should be taken to prevent evaporation during harvest operations. In February the cultivators must be ready to conserve the summer rains and prepare the seed-beds.

Soils.

The country is undulating to flat, with stony outcrops occurring at intervals of several miles. Small areas of soils are of a sedentary character, partaking of the nature of the rocks below from which they were formed, but the greater area comprises soils of transport, derived from granitic and basaltic formations, with occasional outcrops of limestone. Such soils have been formed over a long period of centuries, being deposits from flood waters, changing river beds, water erosion, and wind transportation.

With such a derivation, it is evident that many diverse types of soils and subsoils have been formed, all requiring special treatment for the production of high yielding crops. Discussing the local occurrences of soil types it may be said that on the crests of the rises sedentary soils occur, and are of a red loam character, being usually 9 inches in depth and overlying a clayey subsoil. Coarser and lighter soils of transport are met with just before reaching level country, retentive subsoils often being absent. On the level stretches, where the fine soil particles held in suspension have had time to settle, the soil is usually of a clayey loam texture.

A general change in the type of country is apparent when moving from east to west. From the Bumbury Ranges to within a few miles of Parkes the soil is sandy loam to loam; then until about ten miles west of Parkes red loams predominate, gradually merging into clayey loams as the distance west increases. The stony outcrops before mentioned and ranges of hills which occur throughout the district naturally change the local soil types, and are responsible for lighter soils west of Bogan Gate and Trundle.

For practical wheat-growing purposes the soils of the district may be classified into four distinct types:—

1. Red loam soils, 9 to 12 inches in depth, overlying a clayey retentive subsoil; usually found on the rises and slopes.

2. Deep red loam soils, with no marked change in texture to a depth of more than 2 feet, such as occur to the east of Parkes.

3. Loams to sandy loams, 9 inches in depth, overlying a clayey subsoil, partaking more of the nature of a silty soil, such as occur near Tichborne and Forbes.

4. Deep clayey loams, of the self-mulching type, usually found in myall and plain country, areas of which occur at Gunningbland, south of Forbes, and west of Bogan Gate.

Fallowing.

The all-important factors in fallowing are—(*a*) to enrich the soil by aeration, (*b*) to allow the winter rains to easily penetrate the subsoil, (*c*) to maintain a suitable mulch, and (*d*) to create a suitable seed-bed.

It is essential for nearly all forms of plant life that there should be a free circulation of air between the soil particles. Air, or in other words, the oxygen which air contains, assists in the production of available plant-food, and it is essential to the life of the useful bacteria, without which a soil would be sterile. With a free circulation of soil air the desired changes are most rapid, and the soluble plant-food formed during the fallow period is effectively stored for the use of the succeeding crop. With some soils nature provides self-aeration. The cracking of the heavier soils of the plain country, and the wonderful growth of herbage immediately following the breaking of droughts are familiar to most, and although the growth is generally attributed to the inherent richness of the soil, nature's method of maintaining fertility cannot be disregarded. This is mentioned, as it has a direct bearing on the suggestions for working the deep clayey loam soils, such as are found round Gunningbland.

In support of the importance of aeration, an experiment which was conducted by Mr. W. W. Watson, of Tichborne, in 1923, though not designed as a soil-aeration experiment, may be quoted. Two adjoining areas of 40 acres each were selected, one being disc-cultivated in February, 1922, springtooth-cultivated in June, disc-cultivated in August, and springtooth-cultivated in September, December, and May. This fallow was not ploughed. The other fallow was mouldboard-ploughed in July, 1922, and springtooth-cultivated in September, December, and May. The areas were sown under exactly similar conditions, and at time of sowing the former block appeared to be in the better condition. Germination was even and excellent in both areas. The former yielded 18 bushels 7 lb. and the latter 20 bus. 42 lb. per acre, a difference of 2 bus. 36lb. in favour of the ploughed area. The soil was of a loam to sandy loam type, which does not crack. In view of the conditions that existed throughout the experiment, it appears correct to state that the higher yield was due to the better aeration of the ploughed area.

To secure such aeration, plough the fallow early, preferably in June, and leave it in a rough state until August. If black oats are troublesome, the first consideration should be their eradication, and it may therefore be necessary to break the rough surface, to form suitable germinating conditions. The rough surface advised will also allow the winter rains to penetrate the subsoil more easily.

An effective mulch consists of a layer of loose, dry soil, composed of small clods and fine soil particles, distributed evenly over the whole of the fallow to a depth of $2\frac{1}{2}$ inches. A shallow mulch is not effective in preventing evaporation; a deep mulch compels the sowing of the seed in a loose seed-bed, with the consequent danger of the grain malting and the liability of fungus attacks, owing to there being probably insufficient moisture present to push the seedlings above ground. Such mulches are usually irregular in moisture content, and a patchy germination follows. The mulch should be prepared in October and should be maintained in condition throughout the summer.

A suitable seed-bed is dependent upon mulch and consolidation. By consolidation is meant the degree of compactness of the soil immediately below the mulch and above the ploughing depth—approximately 2 inches in thickness. This layer of soil, which has been "sweetened" during the winter, is well charged with soluble plant-food, and has been firmed by the action of moisture, implements, and stock, until it is in an ideal condition to draw moisture from the subsoil and manufacture a readily available supply of plant-food for the use of the young wheat. When sowing, the seed is placed in the top layers of the consolidated land, and the mulch covers the seed. With an even depth of mulch and a section nicely consolidated, conditions are most favorable for an even and quick germination.

General Recommendations.

The practice of following a wheat crop with an oat crop is gaining favour, and the difficulty in the past season was to secure supplies of seed oats. After the wheat harvest the stubble is grazed and then burnt. The area is cultivated and the oats sown in March, with superphosphate. The crop may be grazed, cut for silage or hay, or left for grain. The land is then fallowed for the next wheat crop. Such a system assists in overcoming disease and weeds, and enables a greater number of stock to be carried. Whether oats be included in the rotation or otherwise, the general recommendations for fallowing are the same.

If disease (take-all, foot-rot, or flag smut) or weeds are troublesome, the stubble of the preceding crop should be burned as thoroughly as possible. This burning will destroy fungus spores and weed seeds, and will at least singe the hairs of the wild oat seeds that are lying on the surface of the soil, causing the seeds later to germinate fairly readily. Give a summer cultivation with a tine or disc cultivator as soon as summer rains will permit. This summer cultivation forms a suitable seed-bed for the early germination of black oats (April and May), and also helps to clear the land of fungus diseases. Commence in June to plough the fallow to a depth of 4 inches. If black oats are plentiful, harrow in the hope of securing additional germination; otherwise, leave the soil in a rough condition. Work with the springtooth cultivator in September to the ploughing depth, thus bringing all clods to the surface and allowing the fine soil to fall below. During the summer maintain the mulch in a loose, dry condition to a depth of $2\frac{1}{2}$ inches, and destroy all weed growth.

Sheep may frequently be used to clean up weed growth. Not only do their droppings add to soil fertility, but the treading which the fallow receives greatly assists consolidation without forming hard surface patches. A fallow so worked is termed a summer fallow, and this method of working is being largely adopted in the central west.

Working of Various Soils.

The above system of working is applicable in a general way, but extra care needs to be taken with certain types of soil to avoid too fine a mulch and also to secure suitable consolidation.

Red Loam Soils.—These soils are generally easily handled, and will stand a reasonable amount of working with the disc or tine implements or harrows. If worked very finely they have a tendency to set, which may prevent the seedlings from pushing through the crust formed after the seeding rains.

Deep Red Loam Soils.—With these soils it is advisable to avoid ploughing deeper than 4 inches, as when the fallowing period is dry it is difficult to secure the necessary consolidation. They are soils which may be frequently worked, as the mulch does not seem to set or cake. It has been demonstrated that fairly heavy dressings of superphosphate—up to 80 lb.—may profitably be applied.

Loams to Sandy Loams.—These soils are rather common near Tichborne, and in parts of the Forbes district. They are soils that set very readily and hard after rain, if the mulch is at all fine. As capillarity is readily secured with these soils it is better to have the mulch on the rough and deep side, working principally with the springtooth cultivator, than to attempt to secure a text-book mulch by using the harrows early in the season. A harrowing just before seeding usually puts the fallow in good order. With a caked surface after seeding, the young plants are liable to turn yellow and wilt, owing to the absence of air and failure to break through. A light harrowing is then necessary, or more rain.

Deep Clayey Loams.—These are soils of the self-mulching type usually found in myall and plain country, very sticky when wet, but the surface crumbles upon drying and in drought time is often scored with deep cracks. Such soils have presented problems in cultivation, and attempts in the past to follow the principles of fallowing—deep ploughing—have probably led to more failures than "roughing in the seed." Once this land is ploughed it is impossible, except in seasons of ample rainfall, to secure consolidation with one period of fallow. The mulch invariably extends to the depth of the ploughing, is open, and consequently dry. The seed must be sown in the mulch, which an inch of rain will not thoroughly wet, and which is dry again before the seedlings are above ground, resulting in malting of the seed or wilting of the young plant. With such methods of cultivation it is essential to have frequent rains immediately after seeding, but unfortunately the climatic conditions do not warrant such optimism.

For the guidance of farmers it is suggested that the elimination of the ploughing should be tried. The early summer cultivation might be given in March, and repeated to maintain merely a mulch of 2½ inches until the sowing time the following year. The number of cultivations need not be limited, as the mulch will not cake. This system was followed by two competitors in the recent Parkes fallow competition, and their fallows appeared in such excellent condition for the reception of seed that they were awarded first and third positions.

Under this system the question of aeration and the formation of a hard-pan need to be considered. With regard to aeration it is probable that the provision of nature in cracking the soil during January and February will be sufficient to maintain fertility, but it is more than probable that the constant tramping of the teams and the action of the implements working at one depth will form a hard-pan. To overcome this it may be necessary to use the plough occasionally, say, once in three seasons. This would also present an opportunity of turning under vegetable matter to maintain the humus content.

General.

The progress of fallowing is occasionally checked by the occurrence of exceptionally good years, when "any old system" will produce a smile of satisfaction by filling a respectable number of bags per acre. Time and labour and money spent on the fallows may then appear wasted. Good fallowing, however, will never depress yields. The good years merely help to keep the bailiff at a distance. It is the payable crops in the lean years that secure the farmer's financial position. The pessimists' view that the next year is to be a drought year is worthy of thought, as crops in the good years will look after themselves.

A Triple Requirement for Success in Wheat-growing.

The experience of this farm in regard to wheat varieties shows that many mistakes are still made about the time for sowing. It is no uncommon thing to receive applications for seed for slow-growing wheats like Yandilla King quite late in the season. The golden rule that late varieties must be sown early still applies.

A good deal of importance is attached to the quantity of seed sown per acre. From 40 lb. to 45 lb. of Zealand is found to be ample, whereas Firbank would give a very indifferent crop on such a seeding, and not less than 60 lb. to 70 lb. is used. Early-sown varieties, which are late-maturing in their habit, may be sown much lighter than late-sown varieties, which are much quicker in maturing.

The advantage in yield obtained by sowing the right variety at the right time in the right quantity amounts to quite 3 or 4 bushels per acre, which is perhaps the farmer's profit on the year's working. It costs 12 to 13 bushels per acre to raise a crop of wheat, and the surplus over that—the result of the farmer's adoption of sound methods—is his own.—H. Ross, Manager, Wagga Experiment Farm.

Farmers' Experiment Plots.

SUMMER GREEN FODDER TRIALS, 1923-24.

Yanco Irrigation Area.

A. N. SHEPHERD, Senior Agricultural Instructor.

THE undermentioned farmers co-operated with the Department in conducting summer green fodder trials during the season 1923-24:—

W. Edwards, Farm 367, Leeton.
A. Cartmel, Farm 804, Wamoon.
P. C. Moran, Farm 802, Gogeldrie.
R. Farrar, Farm 796, Gogeldrie.
F. Blackmore, Farm 938, Stanbridge.
H. Markey, Farm 968, Leeton.
P. Moller, Farm 1,084, Munami.

The season was marked by extremes of temperatures and low rainfall, although useful showers fell at periods.

Up to 9th December the summer had been cool, but for seven days, from 10th to 16th of that month, the daily maximum reached over 100 deg. Fah., the highest being 105.5 deg. on the 15th. This is the longest heat wave recorded in the district since 1906, when temperatures up to 124 deg. were registered. Readings of 41 deg. Fah. were recorded in January, while just previously, from the 14th to the 19th, the average maximum temperature was 103 deg. for the six days. The evaporation from a water surface was: October, 3.446 inches; November, 4.76; December, 6.625; January, 8.631; February, 6.43; March, 5.246; April, 2.897.

The rainfall at Leeton was as follows:—October, 104 points; November, 32; December, 161; January, 79; February, 298; March, 88; April, 211.

The Plots.

Farm 367.—On fairly heavy red soil a manurial trial with Fitzroy maize was carried out. The previous crop was oats without manure; fallowed July, smoothed and checked, irrigated, and cultivated in September. Sown with the wheat drill in rows 21 inches apart, at the rate of 20 lb. per acre, on 10th October. A fall of rain a few days after sowing set the land, which had the effect of preventing many of the young plants from breaking through the crust of soil; thus only fair germination was obtained. The crop was irrigated at each rotation, twice in November and January, and once in December. The crop was cut and weighed in February.

Farm 804.—Two manurial trials were carried out on this farm, one with maize and the other with sorghum. The maize was sown on land that had previously grown Sudan grass with 56 lb. of superphosphate per acre.

The soil consisted of a grey loam, ploughed in September, graded, check-banked, disced, watered and disced, the seed being sown at the rate of 20 lb. per acre, in drills 21 inches apart, on 22nd October. Splendid germination resulted, the plants making good growth. This was an especially good crop, the stalks being fine, with plenty of leaf, and the yield high. The crop was cut and weighed on 15th February.

The sorghum was sown on similar land to the maize, but was the first crop taken off after breaking up the new land. It was ploughed in October, disced and watered, then again disced, check-banked, and sown with the wheat drill, 14 lb. seed per acre, 10 inches apart in the rows, on 5th December. There was rather a patchy germination at first, but the crop evened up following a shower of rain, and made very good growth. It was watered on 20th January, 17th February, and 17th March. When the crop was cut early in May it had attained a height of 12 feet, and gave a very heavy crop of succulent forage, the stalks being very fine and sappy.

Farm 802.—The land on which the experiment was sown on this farm varied from red to grey loam, and although crops had previously been grown, for some years it had been lying idle. The land was ploughed during the winter, harrowed, disced, irrigated, and cultivated before being drilled; then followed with the harrows. The maize was sown on 5th November at the rate of 20 lb. per acre, drills 21 inches apart. The sorghum was sown on the same day at 14 lb. per acre, drills 14 inches apart. Good germination was obtained, and satisfactory growth followed. The crop was watered once in December, twice in January, and twice in February. The maize was cut and weighed early in March, while the sorghums were harvested a fortnight later. No. 34 made good growth, attaining a height of 12 feet. The Saccaline was a very nice crop, while the No. 61 was fairly early and very true to type.

Farm 796.—A variety trial with maize on heavy red land and a manurial test with sorghum on similar land were conducted on this farm.

The maize was sown on new land ploughed in August, irrigated, cultivated, drilled at end of October, superphosphate being applied at the rate of 70 lb. per acre. A fair germination followed, but the crop was rather disappointing, due, doubtless, to the land setting hard after being irrigated. The crop was watered at the end of December, twice in January, and once in February. The crop was cut on 24th March.

The sorghum was also sown on new land, No. 34 variety being used. The land was ploughed in August, irrigated, cultivated, and on 9th December drilled with seed at the rate of 14 lb. per acre. These plots grew very well, attaining a height of over 12 feet. They received one watering in each of the months of January, February, and March, and the crops were cut and weighed on 2nd May. They were ready for cutting much earlier, but owing to rains in April the land was rather wet to work on.

Farm 936.—On a grey loam (new land), Saccaline was sown on 8th December as a manurial trial. Ploughed in September, irrigated, and

springtoothed before drilling at the rate of 14 lb. seed per acre. This land was in splendid condition, and germination was perfect and growth very rapid. It received one watering in each of the months of January, February, and March. The weights of the crop were taken on 22nd April.

Farm 968.—A variety trial was conducted on this farm. The land, which consisted of a grey loam, had carried as the previous crop oats without manure. It was ploughed in October, disced, watered, cultivated, and on 11th December was drilled with 14 lb. seed and 70 lb. superphosphate per acre.

This plot was most disappointing. Although good germination was obtained, the crop did not make the growth anticipated. The first of the plots was cut and weighed in April, and the others as they matured. The crop was irrigated once each in January and February and twice in March.

Farm 1084.—A variety trial with maize was carried out on red to grey loam. The previous crop had been oats without manure. The land was fallowed during the autumn, disced, and harrowed, and on 29th September was drilled at the rate of 20 lb. seed and 70 lb. superphosphate per acre. A very good germination was obtained, but, owing to lack of water, the growth was greatly reduced. The crop received two waterings—one in December and one in January. The weights of the crop were taken on 22nd February, and, although the yields were not high, good quality fodder was obtained.

SORGHUM Manurial Trials.

Manure.	Farm 804.	Farm 938.	Farm 796.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 140 lb. ...	29 6 1 13	25 13 3 27	24 6 0 18
M5, 210 lb...	28 12 3 12	22 6 0 18	21 7 3 8
M13, 182 lb.	26 19 3 3	20 13 3 10	19 17 2 14
No Manure	....	....	17 3 0 24

Saccaline was the variety on Farms 804 and 938, and No 34 Sorghum on Farm 796.

SORGHUM Variety Trials.

	Farm 802.	Farm 968.
	t. c. q. lb.	t. c. q. lb.
Saccaline	23 9 1 6	10 2 3 0
Planter's Friend	20 14 3 12	10 0 2 7
No. 61	18 11 0 0	9 17 0 9
No. 34	18 4 2 13	9 0 2 0
Gooseneck	....	9 15 3 0
Orange	....	9 11 2 0
Collier	....	8 12 1 14
White African	....	9 5 3 7
Early Amber Cane	....	7 10 3 0

MAIZE Variety Trials.

	Farm 802.	Farm 796.	Farm 1,084.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Fitzroy	12 14 0 2	10 5 2 0	11 14 0 0
Large Red Hogan	11 1 2 8	10 4 2 0	9 16 0 0
Cocke's Prolific	....	10 19 1 10	9 12 0 0
Large Macleay Yellow	....	10 6 3 14	8 18 0 0
Yellow Moruya	....	10 5 1 25	....
Macleay Beauty	....	10 3 2 21	....
Golden Drop	....	8 2 3 4	....
Golden Beauty	....	....	8 0 0 0
Golden Nugget	....	....	8 12 0 0

MAIZE Manurial Trials.

	Farm 367.	Farm 804.
	t. c. q. lb.	t. c. q. lb.
Blood and bone, 1 cwt. ...	15 8 0 0	17 5 2 24
M13, 1 cwt.	14 4 0 0	20 5 0 3
M5, 108 lb.	13 15 0 0	16 13 1 13
Superphosphate, 140 lb. ...	12 8 0 0	....
,, 70 lb. ...	12 0 0 0	15 8 3 17
No Manure	11 4 0 0	14 3 3 25

The variety in both cases was Fitzroy. The fertiliser mixture M5 consists of 2 parts superphosphate and 1 part sulphate of ammonia, and the mixture M13 of 10 parts superphosphate and 3 parts sulphate of potash.

Summary.

In the maize trials, as in past seasons, Fitzroy gave the best returns, not only in weight, but in quality of fodder. Large Red Hogan was also very satisfactory. Cocke's Prolific, a white maize producing fine stalks with plenty of leaf, has given good results each season it has been tried. Large Macleay Yellow, a late maturer, has also given heavy yields, but rather coarse in the stalk.

In the fertiliser trial with maize, blood and bone gave the heaviest returns, although closely followed by M13. In all instances the use of fertilisers increased the yields.

In the variety trials of sorghum, Saccaline easily stands first as a producer of heavy crops; the quality of the fodder is also good. This variety has the advantage that it will stand more frost than the other varieties, and even after the leaves may have been killed the stalks remain sappy, and are greatly relished by stock during the winter.

Of the newer varieties, No. 61 is very promising, although this season it was badly affected by red stain in some of the plots. In all instances this sorghum was very true to type, and gave very even growth. It is of the Planter's Friend type, and matures earlier than Saccaline.

No. 34—of the Early Amber Cane type—is early maturing and a heavier grower than Early Amber Cane, attaining a height of over 12 feet, but

the plots this season did not appear true to type, the plants being very mixed. It very soon becomes hard and woody, and at that stage is not relished by stock. The stalks are fine. Doubtless this variety will have its usefulness in small sowings for a big bulk of early fodder.

Orange sorghum is a variety that gave very promising results a couple of seasons back, but owing doubtless to the mixed seed sown this year the results were not nearly so good. Selection may give us again a strain similar to the one previously grown, when it should come greatly into favour.

Of the other varieties tried, Gooseneck—although with the seed sown it appeared light and inferior—gave good results on one farm. The other varieties call for further trial.

The manurial tests with sorghum in each instance gave the plot dressed with superphosphate the advantage. In all cases exceptional yields of fodder were obtained.

A Seasonable Reminder.

The phenomenal response to a recent departmental reminder as to the availability of a pamphlet on tomato growing emphasises the demand existing for advice on the production of crops of this type. The approach of spring is doubtless prompting many *Gazette* readers to consider the cultivation of one kind of vegetable or another as a home or market garden proposition. Special attention has been paid by the Department to this branch of agriculture, and "Vegetable Growing in New South Wales" can be recommended to all in need of a complete and authoritative handbook. Applicable to both domestic and commercial conditions, it is obtainable from the Government Printer, or the Under Secretary and Director, Department of Agriculture, Bridge Street, Sydney, for 2s. 8d., post free.

Southern District Bureau Conference.

The fourth annual conference of branches of the Agricultural Bureau in the Southern District will be held at Leeton on 30th September, and the three following days. The district is one of exceptional interest, and an attractive programme is being arranged. By courtesy of the Water Conservation and Irrigation Commission, accommodation is being made available for two hundred visitors at a particularly reasonable rate. Those intending to be present should communicate with the Department for details as to rail concessions and other arrangements. A hearty welcome is extended to Bureau members and farm folk throughout the State.

Many sheepowners do not recognise the sheep louse. Any veterinary surgeon, inspector of stock or officer of the Sheep and Wool Branch, will willingly demonstrate the method of examination for lice and the appearance of the insect.

COTTON IN THE SOUTHERN DISTRICT.

TRIALS carried out during the past season demonstrated clearly the impossibility of growing cotton commercially on upland (ordinary wheat land) soils in the Riverina and South-western Slopes. The only cotton to make satisfactory growth was that planted on the flats adjoining the creeks and river. The excellent water-holding capacity of this country made satisfactory growth possible, but the summer season proved rather short for the plants to mature sufficient cotton to make the crop payable. As a matter of fact, it was only late in the season that bolls were produced, and only the earliest bolls produced mature cotton, cool nights toward the end of the summer retarding development of the rest. Frosts in May eventually stripped the plants of all foliage, leaving only the immature bolls.—E. S. CLAYTON, Agricultural Instructor.

SULPHUR AS A FERTILISER.

DURING recent years much has been heard of the wonderful results obtained on certain soils in the United States from the use of sulphur as a fertiliser, and inquiries are received from time to time by this Department as to its effect upon the soils of New South Wales. Six years ago tests were carried out at Wagga and Cowra Experiment Farms, particulars of which experiments were published in this journal (July, 1920, p. 462). The results of these trials were not such as to justify the use of sulphur as a fertiliser on the wheat crop.

The subject was revived about eighteen months ago in connection with lucerne-growing on the Murrumbidgee Irrigation Area. It was then decided that, in view of the good results obtained on those soils from the use of superphosphate applied to lucerne crops, it would be advisable to conduct tests of a similar nature, using sulphur alone and in combination with superphosphate as a top-dressing.

At the same time it was thought advisable to conduct a test at Glen Innes with oats (the main crop in that district), since such marked results have been obtained in New England from the use of fertilisers.

Reports of the first year's tests are now to hand, and so far they merely confirm those obtained in the previous tests with winter cereals. Detailed figures for the tests will be published when they have been carried on for three seasons.

At Glen Innes, tested on oats (cut both for hay and for grain), and used both alone and in combination with superphosphate, the results were negative.

At Yanco the results seem to indicate the bare possibility of good results being obtained by the use of a combination of superphosphate and sulphur, although the use of sulphur alone has given no appreciable increase.

It must be stressed that it is yet too early to draw any conclusions from the tests. The object of this note is to let the agricultural public know that the Department is endeavouring to settle, as far as the soils of New South Wales are concerned, a question which during recent years has excited considerable controversy in the United States of America.—R. G. DOWNING, Senior Experimentalist.

It is often asserted that sheep are free from lice because they show no outward evidence of the presence of the pest, but to make sure a close examination must be made. The louse multiplies very rapidly when conditions are favourable.

Wagga Experiment Farm.

Some Recent Experiences.

W. H. BROWN, Editor of Publications.

"Nothing pays to-day as well as raising fat lambs." In these words Mr. Hugh Ross, Manager of Wagga Experiment Farm, affirmed his full accord with recent utterances on a subject about which a good many farmers are beginning to think alike. The figures which he was able to quote as to the farm's transactions go to show that the statement is not an extravagant one.

The farm comprises over 3,200 acres, but activities are numerous and varied, and only 372 acres are actually available as grazing for the flocks, and on that area, supplemented by about 100 acres of cultivated fodder crops and the pickings of the fallows and stubbles, approximately 1,000 cross-bred ewes are run. With a marking of 92 per cent. in 1922, and of 91 per cent. in 1923, the flock must be regarded as highly profitable. In the latter year there were only about 700 ewes on the farm, and of the 630 lambs marked, 560 were sold early in November at 24s. in the paddock, others being disposed of shortly after at 20s. per head. When to these figures is added the 13s. which the ewes averaged for wool per head the return amounted to 32s. or 33s. per head over the whole flock. As the line had originally been purchased as two-tooths at 25s., and after yielding four crops of lambs was sold on a low market at the end of 1923 at 18s., it will be agreed that it was a sound investment.

The methods of raising fat lambs differ somewhat in different parts of the State, but those which were successful at Wagga are applicable to a considerable area of wheat country in the Riverina and South-western Slopes.

As a result of many years' experiments it has long since been accepted at this farm that Border Leicester-Merino and Lincoln-Merino ewes are most profitable. Both types have their advantages, but, generally speaking, it is immaterial to the raiser of fat lambs which he uses. The Border Leicester-Merino wool is finer and would probably bring a better price, but on the other hand the Lincoln-Merino wool does not get so "raggy" on the legs and belly in a growthy season. The line of ewes now on the farm is Lincoln-Merino cross (purchased in 1923), but the previous line was Border Leicester-Merino, from which it will be deducted that more is attached to general type and class than to the actual cross.

What Mr. Ross mainly keeps in view is that the lambs must be put on the market before grass seeds have made their appearance, and before the weather has become dry and hot. It has been found that both these conditions affect the "bloom" of the lambs, and that their value at once

declines by as much as 7s. to 10s. per head. It is, therefore, imperative that the lambs be raised so as to miss these conditions. On the other hand, they have also to be raised when it is possible to ensure plenty of soft succulent feed for the ewes.

The programme has therefore to be carried out within somewhat narrow limits, and it is essential that the lamb itself shall be characterised by quick maturity—in other words, that it shall reach a commercial weight in the shortest possible space of time. In addition to the right ewe being selected, therefore, the management of the flock must be also directed so as to ensure the most rapid development possible.

Here the Department's experiments afford help by indicating the class of ram that can be used with the greatest advantage. The Dorset Horn breed is noted for the quality of its mutton, and for its early maturing habit, and it has been found that rams of that breed transmit these characters to their progeny.

The fat lamb market demands that for export the dressed carcases shall run 37 lb. to 40 lb., and while it is possible that other breeds would give heavier lambs, there is probably no breed that will give the desired weight at such an early age as the Dorset Horn. Bigger lambs, perhaps, could be obtained by crossing Lincoln rams on Lincoln-Merino ewes, or by crossing Border Leicester rams on Border Leicester-Merino ewes, but they would be slower to mature, and grass seeds and hot weather would be on hand before they were ready for market. Some people imagine that the Dorset Horn is used because it produces good mutton, but that is not the main reason. It certainly does yield excellent mutton, but it does better—it leaves a very early-maturing lamb. Possibly in some localities the long-wools would do all right, provided lucerne or other high-class fattening crops were available, but not so in the average Riverina wheat country.

Mating is usually started in the middle of December and extends through January, and the drop is expected in May or June, which allows four and a half to five months before the middle of November, when grass seeds and heat generally begin to loom upon the horizon. Uniformity in the line is an obvious recommendation to the buyer when he inspects the lambs, and it is well therefore to mate 2 per cent. of rams and to yard the flock at night a few times. In one season 90 per cent. of the lambs were dropped within a few days, and the line was the most even ever offered by the farm, and easily commanded top price.

The ewes are lambed in paddocks that are well sheltered by belts of trees which run in every direction. Seclusion and shelter are considerable advantages, though grass and herbage are not so abundant as if all the timber had been rung.

During lambing the flock must be visited at least once every day. A proportion of ewes require assistance, and others become cast, and crows and foxes are continually on the watch.

The ordinary pastures of the southern portion of the wheat belt are usually quite insufficient, and often quite unsuitable for raising fat lambs

for export, and cultivated crops must be resorted to. The practice at Wagga is to sow 100 acres of Skinless barley or of oats each year, and immediately lambing is over to turn the ewes and lambs on to this paddock.

Young lambs thrive better on their mothers' milk than on anything, and the better and more luscious the feed for the ewes the more milk there is for the lamb. Nothing could be more suitable for this purpose than the luxuriant crop of Skinless barley which was to be seen growing on the farm early in June. It was already forward enough for sheep to be turned on at once, and with lambing nearly half over, the crop and the sheep would be ready for one another in a few days.

The cultivated crop has the advantage, too, that it enables the pasture paddocks to be spelled for a while, and when the crop has been eaten down the sheep return to the pasture where a fresh spring of green grass awaits them, and the barley in its turn gets a spell. Alternating the crop and the grass in this way at intervals of two or three weeks, the lambs grow apace on an abundant supply of milk stimulated by the fresh, sweet feed. As the marketing stage is reached the grazing is arranged so that the lambs are sold off the crop, having had the last two or three weeks thereon.

A mistake made by many farmers is to hold too long, probably with the object of letting the lambs get a little bigger, but with the drying of the pasture, and the ripening of grass seeds as the weather gets warmer the lambs lose "bloom," and the farmer finds that for some reason the line that he expected to be so profitable has declined in value.

At Parkes, Mr. Clatworthy made the remark that "the great thing is to prevent loss of bloom, and I would prefer marketing a shade on the small side than a heavier lamb that has become dry." With that remark Mr. Ross is in full accord, for once the bloom is off it can never be recovered. A couple of days on dry feed or on seedy pasture, and lambs can be seen to become "dry" at once. They may be held over for a year, giving a clip of wool and a mutton carcase later on, but they are never so profitable as they would have been as lambs.

Cultivation Methods.

Time was when fallowing was regarded as well done in the Riverina if work was started in July and finished before the end of August. As firmly convinced of the value of fallowing as ever—this manager to-day begins the work earlier still, and on 5th June this year 150 acres had already been ploughed in view of next year's sowing. The balance would be finished by the middle of July. "The earlier we can fallow the better; early-fallowed land absorbs the June rains, so reliable in the Riverina."

Cultivation is carried out as required, and sheep are grazed over the fallows because they keep down the weeds, fertilise the soil, consolidate the subsurface soil, and produce a compact seed-bed. As many sheep as possible are put on at a time, and the last cultivation is given shortly before the drills go on the land.

Sowing is done early, and if the crop becomes a bit forward it is fed off early in the winter. In no case should feeding off be extended beyond the end of July, or the crop will suffer.

Silage.

Fallowing is practised in relation to all crops, with two exceptions—the barley intended for the ewes with lambs at foot, and any crops sown for silage.

There are two pits 18 feet wide, 7 or 8 feet deep, and 70 feet long on the farm, and each year crops are grown to fill one or both, as may be necessary. What value may actually be attached to silage in the pit it is hard to say, but about the cost of the stuff there is little room for argument. In the 1919 drought, when hay was worth £15 per ton, £9 per ton was offered for silage on the farm, the actual cost of which for growing, curing, and storing had only been 13s. 4d. per ton The difference between 1 lb. per head per day of hay at £15 per ton for, say, 1,000 sheep, and 2 lb. per head per day of silage at 13s. 4d. per ton in the pit is easy to calculate. When one recalls the straits to which some farmers are reduced in periods of scarcity, and the appeals that are hurriedly made to the Rural Industries Board, and when one further remembers the leeway that has to be made up—often enough only just in time for the next drought—the marvel is that men allow themselves to be found in the same predicament so often.

The loss by crop failure in a drought is serious enough, but it is small compared with the position of a farmer who has lost his livestock. The truth of this will be realised when it is recalled how quickly a farmer "gets on his feet again" who still has his sheep or his cattle in fair order when the break comes.

The making of a pit silo has often been described, but the details to which importance is attached at Wagga Experiment Farm are that the sides should be perpendicular, and the depth should not be less than 7 or 8 feet. Without these conditions it is impossible to get pressure on to the material and to cure it properly. A good many farmers who have had failure or only partial success with pit silage have failed at these points, scooping out a shallow depression with the idea that "anything would do." As a matter of fact, a little system in the making of the pit is essential if the silage is to be of good quality.

In the Orchard.

The distinctive feature for which the orchard at this farm has long been famous is the prune crop. If the orchardist, Mr. J. C. Allison, were asked the secret he would probably reply that it lies in the care exercised both in the growing and in the curing of the product.

The largest block of trees is the 18 acres of Prune d'Agen, and Robe de Sergeant comes next with 9 acres. For some years a good deal of interest has been taken in the subject of pollination, it having been observed in more than one part of the orchard that Robe de Sergeant, when adjacent to certain plums (notably Giant, de Montford, and Angelina Burdett), crops

100 per cent. better than when contiguous to Prune d'Agen trees, and 200 per cent. better than when "Robe" is forced to act as a self-polleniser. In consequence, steps are being taken to work over a number of trees in the block of "Robes" to the three plums mentioned. In a few places, old trees will be removed altogether, owing to the depredations of white ants, and there young vigorous plum trees will be planted. As a result, each Robe de Sergeant will hereafter be within 24 feet of some other variety, which will be expected to act as a pollenising medium.

Notwithstanding that the orchard soil was well and truly cleared and deeply worked when it was being planted many years back, white ants are continually in evidence, and it is often observed that so soon as a tree receives the shock of being cut back prior to re-working, the termites seem to get in and the tree perishes.

A great deal of importance is attached to subsoiling in connection with the planting of young trees, whether as individuals or in new blocks. In the latter case a subsoiler, making a track 6 feet wide and 16 to 18 inches deep, and requiring eight horses, is used along the track that is approximately to be occupied by the trees. A good body of worked soil is thus prepared for the young trees, and it has been found to pay handsomely in the subsequent growth, the difference where such subsoiling has not been practised being most marked.

By subsoiling in this way and mulching freely with stable manure, pear and plum trees 3 and 4 years old have been transplanted with much success. In one case, when in the season following the planting there was less than 2 inches of rain from October to May, the loss among a number of such transplantings was less than 5 per cent. The secret of success, other than subsoiling and mulching, lies in planting or transplanting quite early in the season. As soon as the leaf falls the work should be carried out; the removals referred to above were carried out in June and early July. The value of the stable manure, by the way, is not so much its direct effect on the life of the tree as its value as a mulch for the conservation of moisture.

Frequent cultivation is practised during the summer until February, when that work ceases until winter. Any weed growth that may have sprung up in the autumn is turned under, beginning in May, to a depth of 6 to 8 inches. From springtime the cultivator is kept going, the whole area being worked at least once every three weeks, and after every fall of rain.

One of the effects of this cultivation is the control of insect pests. Weeds and grass on the headlands, banks, and borders of the orchard afford harbour in which insects multiply enormously until dry weather in the middle of summer forces them in greatly increased numbers to look elsewhere for the necessaries of life, and an orchard or cultivated crop is the very thing for them. Cape weed offers excellent harbour for such pests; so also do tall grass and weeds along the fence line. Even a lucerne stand is a fine thing for the pests until disturbed by the mower.

The opinion is firmly entertained by this orchardist that fruit-growers would find it well worth their while to buy young stock and work them for

themselves. They would find it more economical; they would be able to select their own budding wood, and the results would be more satisfactory.

Budding and grafting are not difficult operations to learn, and the orchardist who carries out this work for himself will find he much better understands an elementary part of his own business. As to budding wood, no grower, perhaps, needs to be told that it should be taken from trees that are known consistently to have borne good crops of good quality and truly typical fruit for several seasons.

Profits from Pigs.

At the piggery activities are attended by large and profitable litters and by prices for pure-breds and for porkers and baconers that proclaim the success of the methods adopted. Only pure-bred Berkshires are kept, and sows that consistently throw small litters or that fail to exhibit a capacity to raise healthy quick-growing youngsters are culled out. The result is a stud of increasing value.

The practice is to put a sow to the boar at about 9 months old, and after the young pigs are farrowed to leave them with her until they are 9 or 10 weeks old, when they are weaned. Usually the sow "heats" again within a few days, and she is served at once, with the object of ensuring two litters per year.

It goes without saying that discretion between the feeding of the dry sow and of the sow with young is necessary. For the suckling sows, skim milk mixed with boiled wheat or pollard makes one of the best rations, but the farm has not a large dairy herd and, practically all the milk is used for rearing calves and for the officers and students' quarters, and it is found that a combination of half pollard and half crushed wheat, mixed with water to make a sloppy porridge and with any kitchen offal available, is quite suitable Two foods should be avoided for suckling sows—barley, which is too heating and has a tendency to reduce the milk flow, and large quantities of dry grain. The food must be sloppy for suckling sows. An adequate supply of green feed (lucerne or whatever else may be available) is of value.

The dry sows are chiefly grazed, and if plenty of green feed is available they are only fed once a day and that with whole wheat. Better results as to the number and quality of the young stock, and as to the sow herself, are obtained at farrowing time, if the brood sow is kept in somewhat lean condition.

Boars that are not required for stud purposes are usually castrated at 5 to 6 weeks old, and are turned, with the young sows not required for breeding, into a grazing paddock sown with lucerne or barley, and in addition are fed twice a day on crushed, boiled wheat or crushed barley mixed with a little pollard and water. When about 3 months old they are put into a sty, fed three times daily as much as they can eat, and are usually fit for the butcher as porkers, 80 lb. to 90 lb. per head, at 4 months old. For the last fortnight they are also fed whole dry barley to firm up the flesh. It is found that barley meal fattens quicker and better than wheaten meal.

The service boar is kept in a yard about 2 chains square, and is never allowed to run with the sows. Plenty of green feed is always available for him, and in addition to the ration given the sows he receives an extra meat diet, cooked meat on the bone being fed, but he is never allowed to put on too much condition.

Diseases, as the term is commonly understood, are practically unknown. Constipation in the sow has continually to be guarded against. It often develops a few days before farrowing, the result of her increasing indisposition to exert herself and of being brought in from a paddock (in which she has had room for plenty of exercise), and confined in a small pen in in which she can get none or little. Sometimes constipation develops a few days after farrowing, the result again of lack of exercise. In the first case the effect will be difficulty in farrowing, and in the second it will be insufficient milk for the young. Many farmers have observed a diminution in the milk flow without realising that the failure of the bowels to act regularly was the reason.

If there are evidences of constipation before farrowing 2 or 3 oz. of Epsom salts should be administered. Difficulty is sometimes experienced in getting the sow to take salts, and in such a case it is found a good plan to starve her for the morning and up till, say, 3 p.m., when a pint of milk to which two or three spoonsful of castor oil have been added is put before her. As by that time she is ravenously hungry, she generally takes the dose greedily.

Much disease and trouble among sows is due to unhygienic, damp conditions in sties, complicated affections being the result, especially in cold, wet weather. The obvious remedy (to use a euphuism) is prevention—the provision of a large, well-ventilated rain-proof shed with at least 6 inches of dry straw. With warm, comfortable conditions like that the animal is less likely to expose herself to cold and damp.

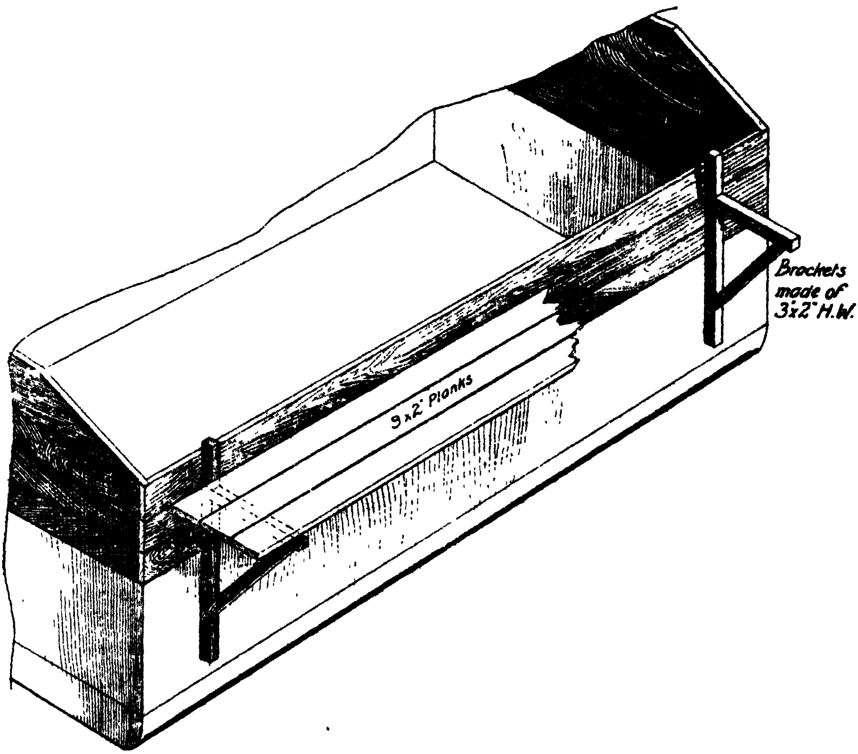
Warmth in winter, in fact, is essential to both young and old pigs, in the fattening pens and in the breeding sties. Cool, shady retreats, and plenty of water—per contra—are the requirements of summer months.

Agricultural Education by Motion Pictures.

Motion pictures have been used by the Live Stock branch during the past two years. Some strictly technical films have been made. Scenarios are prepared by officers of the branch, who also superintend the locating of suitable settings for the pictures, the necessary properties, &c. Although there is a certain disadvantage in the treating of highly technical subjects, this will be practically eliminated by the use of a projection machine with a special shutter, which allows for the stopping of the machine at any particular scene. The programme of the meetings at which these pictures are shown is usually arranged to provide some variety. The motion picture as a means of actually depicting agriculture in all its varied phases is increasing in popularity. Officers report good results from the use of the pictures, which are in increasing demand.—W. R. Motherwell, Canadian Minister of Agriculture, in a recent report.

The Bulk Loading of Wheat.

AT sidings where there are no silos, a good deal of difficulty has been experienced by farmers in loading wheat into the bulk trucks supplied by the Railway Commissioners. The greatest difficulty has been experienced in emptying wheat from bags into these trucks, it being practically impossible to get the dray or waggon close enough to the truck to enable the operation



A Hanging Platform for the loading of Wheat from Bags into Bulk Trucks.

to be carried out with ease. Several devices have been tried, but the one illustrated in the accompanying sketch is perhaps one of the best. It consists of a sort of hanging platform, which is suspended by strong chains and hooks on the side of the truck. The photograph shows that the platform is quite strong enough to support two or three bags of wheat and the men handling them. On such a platform the bags can be opened and the contents poured into the trucks with ease.

The device is actually in use at one siding, and is reported to have proved quite satisfactory. The original drawings and photographic print were made available to the Department by Mr. F. Dowling, District Superintendent of Railways, at Parkes.

The Platform in use.

A Reminder to Sheepowners.

With the shearing season at hand, attention may be drawn to the value of dipping sheep within a reasonable time off shears. Though the operation can be carried out at any period, from a month to six weeks after shearing is usually considered a suitable time.

Only by dipping can sheep be kept free from ticks and lice. Lice in particular can lead to very extensive loss, and it is perhaps not generally recognised how rapidly they can multiply when conditions are favourable. Because sheep do not exhibit marked signs of infestation it is often assumed that they are clean. A close inspection is necessary to decide the point. What appear to be clean sheep to-day may be grossly infested in a few weeks. —Max Henry, Chief Veterinary Surgeon.

Statistics of the agricultural and pastoral industries in New Zealand (to hand in the form of an extract from *Monthly Abstract of Statistics*, 26th June, 1924), show that the area under turnips in both of the last two seasons was larger than that under any other crop. In the season 1923-24 turnips occupied approximately 475,000 acres, with oats 415,000 acres second, while in the previous season the respective figures were 493,000 acres and 468,000 acres. The place that livestock has in farming in the Dominion can be read in those statistics.

Summer Fodder Trials in the Southern Districts.

E. S. CLAYTON, Agricultural Instructor.

THE following farmers co-operated with the Department in conducting summer fodder trials during the past season :—

A. N. Stacy, "Camelot," Tumut.
B. J. Stocks, "Linden Hills," Cunningar.

At Tumut the fodders were planted on the 9th November on heavy black soil; the rows were 3 feet apart, and superphosphate was applied to each plot at the rate of 84 lb per acre. The crop germinated well.

At Cunningar the experiment was planted on the 25th October on red sandy soil; the rows were 3 feet apart, and superphosphate was applied at the rate of 40 lb. per acre. Germination was satisfactory, but the growth was rather poor on most of the plots.

The rainfall during the growing period was as follows :—

	Tumut.	Cunningar.		Tumut.	Cunningar.
	Points.	Points.		Points.	Points.
October	...	...	March	99	68
November	59	46	April	234	...
December	272	278			
January	14	62	Total	1,205	847
February	527	393			

The highest yields at each centre were produced by the late-maturing varieties of sorghum. At Tumut, White African, Collier, and Saccaline gave excellent yields. On the richest soils in the Tumut district Fitzroy maize may be depended upon to give better yields of green fodder than can be obtained from sorghum, but on the second-class country (similar to that on which the experiment was conducted) the heavier yielding varieties of sorghum are likely to give the best results.

The yields per acre were as follows :—

Variety.	Tumut.	Cunningar.	Variety.	Tumut.	Cunningar.
Sorghum—	t. c. qr.	t. c. qr.	*Sorghum*—contd.	t. c. qr	t. c. qr.
White African ...	19 2 3	5 8 1	Dwarf Kaffir ...	11 7 3	......
Collier	19 2 3	5 3 0	Milo	8 11 0	2 19 1
Saccaline ...	19 2 3	5 4 0	Feterita	8 3 0	3 2 3
Planters' Friend	17 9 2	4 18 1	Early Amber Cane	5 13 3	5 0 0
No. 61	16 19 3	4 10 3	Sudan Grass ...	4 9 2	4 1 0
Bolong	16 1 3	4 10 3	Japanese Millet ...	3 12 3	failed.
Orange	14 2 3	2 4 0	Hungarian Millet ...	2 17 0	failed.
No. 34	13 5 1	3 0 2	Fitzroy Maize ...	11 5 3	......
Gooseneck ...	12 19 1	1 3 1			

Field Experiments with Rice.

Coonamble Experiment Farm.

L. J. GREEN, Experimentalist.

A VERY successful trial was carried out with rice at Coonamble Experiment Farm during the season 1923-24. The rice of which the varieties grown here are typical is known as "wet" rice, as distinct from "dry" or upland rice, which latter, although it does not require to be flooded as does the former, demands exceptionally continuous heavy rain (such as is experienced in the monsoonal regions) to keep the soil moist. Wet rice is a crop that requires the ground to be covered for the major portion of its growing period with approximately 6 inches of water, and for this reason can only be grown where a constant and assured supply of water is obtainable. This condition is not met with to any extent in New South Wales outside the irrigation areas in the south and the large artesian-supplied area in the north-west. The crop has proved a success under trial conditions on the Murrumbidgee Irrigation Area; and it was with the object of ascertaining its suitability to the conditions obtaining in the north-west, and more especially its behaviour when irrigated with artesian water, that an area of a quarter of an acre was prepared and sown.

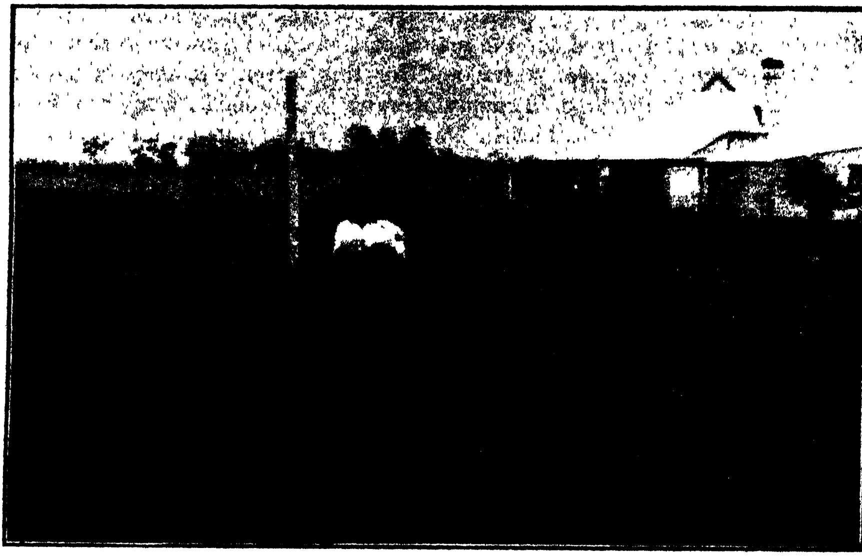
A heavy black soil was chosen for the trial, as being typical of the district. It proved not so suited to the crop, however, as the lighter red soils met with occasionally in the locality and of which there is a small area on the farm. The paddock of which the plot is a section had been sown with Sudan grass in January, 1921, the crop being cut for hay, the stubble grazed, and the land irrigated occasionally during 1922 and early 1923 and kept stocked with sheep. On 20th September, 1923, the ground was cultivated deeply. At this time the paddock was bare (having been eaten out) and hard, and the soil turned up rather cloddy. The piece of ground for the rice was generally level, although in common with the remainder of the paddock it had a very slight fall to the west. This was lessened as much as possible by grading, which also had the effect of producing a fine seed-bed. A bank was erected around the plot by means of a plough and grader. This produced a wide, firm bank, which, however, had to be built up 3 inches higher with a shovel.

Sowing.

An ordinary 15-hoe wheat drill, set to sow wheat at the rate of 135 lb. per acre, was found to sow rice at 110 lb. per acre, and as this was the desired rate, no difficulty in sowing was met with. The seed-bed, as a result of having been smoothed over with the grader when the land was being graded, was very firm at time of sowing, with the result that none of the rice seed was sown at a greater depth than half an inch, and in some places was uncovered. No fertiliser was applied. All plots were sown on 27th October,

Irrigating.

Irrigation was commenced immediately after sowing, the water being run on to the plot and the land kept just submerged all the time. The object of this was to prevent weed seeds from germinating. To the germination of the rice, on the other hand, such submergence is no deterrent, even when it is lying on top of the ground; in fact, in some rice-growing districts of other countries the seed is broadcasted on the already flooded ground. The optimum depth at which to keep rice flooded is 6 inches; but this was not the depth immediately placed upon the plot, for with a shallower irrigation to commence with (in this instance 2 inches) the plants stool much better. When the plants were 6 inches high, however, the depth was gradually

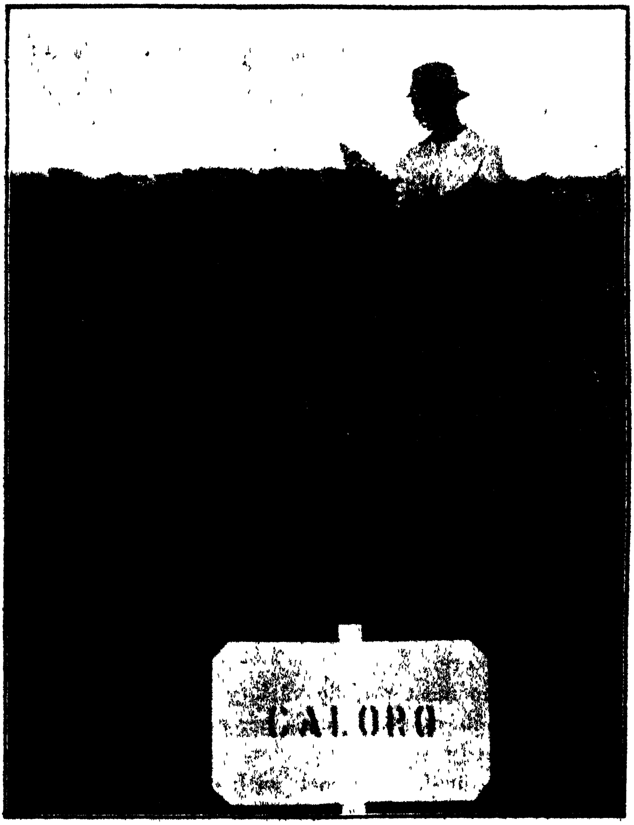


General View of Rice Plots at Coonamble Experiment Farm.

increased (over a week) to 6 inches. Again, the ideal condition is to have slowly-moving water, with a constant and even source at the entrance to the plot. During the earlier growth of the rice this was not possible, owing to the demands of other summer crops on the farm. When the rice was 18 to 24 inches high, however, heavy rains were experienced (24th December), and from this time onwards the water was kept slowly moving about as much as would run out of a half-inch pipe, and slightly more when the plants were flowering, being the quantity run on. As was expected with the bore water, a scum appeared on the surface after a couple of weeks, but this did not appear to have any detrimental affect on the young growth, and when the water was kept slowly moving it in time disappeared.

Water was kept on the plots until 21st March, 1924, on which day it was allowed to drain off slowly, until on 2nd April the ground was firm enough to work on.

Three varieties—Colusa, Caloro, and Wataribune—maturing in that order, were sown, and as there are a few days between the maturity of each, and all were sown in between the one lot of check banks or levees, the water could be drained off to suit one variety only. As Caloro was very promising and would mature midway between the other two varieties, and as 2nd April suited this variety, this was the date chosen. Colusa was well served by



Rice (Caloro variety) at Coonamble Experiment Farm.
Yield, 165 bushels per acre.

by this date also. Wataribune had not reached the proper stage, however, and this resulted in the harvesting of the latter a little on the unripe side.

Harvesting.

As the plots were so small, it was impossible to make use of the combined harvester; this was found to be the case with the reaper and binder also, and each variety was harvested in turn with the sickle.

Colusa was cut on 2nd April and Caloro on 5th April, but it was not until 16th April that Wataribune was sufficiently mature. The plants were tied in sheaves, allowed to lie for a day, and then threshed with a harvester driven by a 7 h.p. steam engine. With this method a quantity of grain was

lost on the ground at cutting, and a certain amount was knocked out of the heads through so much handling. By the use of a harvester, however, a similar amount would probably have been lost.

A particularly pleasing feature of this trial was the total absence of weed growth in the rice, although on the adjacent check banks were to be seen many common water weeds, such as wild aster or stick-weed and barnyard grass.

Varieties.

The seed used in this trial was obtained from Yanco Experiment Farm; it had been grown there during 1922-23, and harvested from a 50-bushel crop. All the seed, however, came originally from America.

Colusa.—This is the earliest maturing of the three varieties grown. On 9th February heads were showing, and on 29th March the crop was ready to harvest, making a total growing period of 154 days, exactly the period taken by a crop of the same variety in California. Maturity would probably have been earlier, however, by about four to six days had not some particularly cool weather been experienced during the early part of January. This had the effect of giving the leaves a frost-bitten appearance, which condition was noticeable right on to maturity. Colusa suffered most from the cold snap, and took longer to make a recovery. The other two varieties were not so badly affected, and recovered much more quickly.

The germination of this variety, in common with that of the others, was fair—none was excellent. Only a fair stooler, it grew to a height of 3½ feet. It was very even and held the grain well when matured. This American variety was originally selected from a Chinese variety, obtained from Italy in 1909. It ranked second in yield in this trial, yielding 645 lb. of rice to the plot. As the plot measured one-eleventh of an acre, this was equivalent to 7,095 lb. per acre, or expressed in bushels at 44 lb. to the bushel, 161 bushels per acre.

Caloro.—This was the most prolific variety on trial, yielding 661 lb. to the plot, equal to 7,371 lb. or 165 bushels per acre. The variety is a selection from a crop of Early Wataribune rice grown in California in 1913. It is a strong and vigorous-looking sort, with large panicles. It is a good stooler, and closely resembles Wataribune, of which it is a near relative. The date of maturity was eight days later than that of Colusa, and fourteen days earlier than that of Wataribune.

Wataribune.—This was until recently the most popular variety grown in California, but it has since been replaced by the other two varieties in this trial, by Early Wataribune (a selection of Wataribune) and by Onsen, all earlier maturing.

In this experiment Wataribune made excellent growth; it stooled more heavily than the others, was least affected by the cold spell, made most growth, and was throughout the most promising and the best looking. Owing, however, to its lateness of maturity, it was not far enough advanced when the plots were dried off, and as a result the grain suffered a severe setback. Moreover, the deneness of the crop and its height (over 4 feet),

combined with the class of soil, caused a large area to lodge, increasing the difficulty of harvesting, and also causing a large amount to be lost on the ground—much more than in the case of the other varieties.

Wataribune yielded 544 lb. to the plot, equal to 5,984 lb. or 136 bushels per acre. This yield would have been much nearer the 160-bushel mark had not a lot of the grain been lost at harvesting, and in all probability it would have passed this mark had the land been kept under water for a further fourteen days.

The success obtained in this first trial augurs well for the future of rice in this district should it become a commercial crop. With the area under trial nothing better could have been wished for as regards yield, although a certain amount of difficulty would have been experienced on a larger area with the harvester, owing to the heavy crop and the tendency to lodge in the thicker portions.

In each case the area of the plot was one-eleventh of an acre, the sowing date 27th October, and the rate of sowing 110 lb. seed per acre. The periods taken by the different varieties to mature and the yields obtained may be tabulated as follows:—

Variety.	Date harvested. (1924.)	Days maturing.	Yield per acre. lb.	bus.
Colusa	2nd April	158 (ripe 154)	7,095	161
Caloro	5th April	161	7,371	165
Wataribune	16th April	172	5,984	136

Conclusion.

Rice when in the husk is called "paddy," and the removal of this outer covering is necessary before it can be placed on the local market for human consumption. Many machines are suitable and available for this purpose, working generally on the system of a corn-cracker. One such machine costs £42 f.o.b. Glasgow; requires a 7 h.p. engine to drive it, and hulls up to 1,000 lb. of paddy per hour. It is in this form (as hulled or unpolished rice) that this commodity is introduced into New South Wales. A duty of 3s. per 100 lb. would protect to a certain extent any local growers.

The percentage of hull on rice is about 20 per cent. (rarely higher), depending on the quality of the grain; about 43 to 45 lb. of paddy go to the bushel, according to the quality and variety. All rice used in New South Wales is imported, and the demand is greater than the supply The price quoted by Sydney merchants varies; at the present time it is £14 10s. per ton for hulled rice. This gives a return from a 100-bushel crop (4,400 lb.) of 3,520 lb. hulled rice, worth at the price mentioned £28 9s. in Sydney.

The overhead expenses involved in the growing and marketing of rice are little more than in the case of wheat, the difference being due to the erection of banks, costs of and application of water, and the harvesting of a heavier crop. While it has been proved in rice-growing countries that rice can be grown on any heavy (not sandy) soil, it exhausts the soil to about the same extent as wheat, though in many thickly-populated centres such as Burma and Malaya the same area is cropped year after year. The feature

which principally prohibits the continual cropping of rice land, however, is the heavy weed growth, for after about four seasons the land becomes foul and requires a cleaning fallow.

The soil, climate, and conditions in the artesian area are ideal for rice-growing, and there are unlimited areas to be worked, the one obstacle being the limited supply of bore water available. An average bore giving, say, 370,000 gallons per day as on this farm, should, however, irrigate 100 acres of rice, using the drainage water from one plot to irrigate the next, and this area, with a successful crop, would show a handsome profit. It is intended to sow a large area of rice on this farm during the coming season, using as the principal variety Caloro, although sowings will also be made of the other two varieties.

Yanco Irrigation Area.

A. N. SHEPHERD, Senior Agricultural Instructor.

FOLLOWING on the encouraging results obtained from the rice trials during the previous season, arrangements were made with the Water Conservation and Irrigation Commission for a further trial of rice during this season.

The Commission co-operated in that they supplied the land and also defrayed the cost of the experiment. The trials extended over an area of 6 acres, the following tests being carried out:—

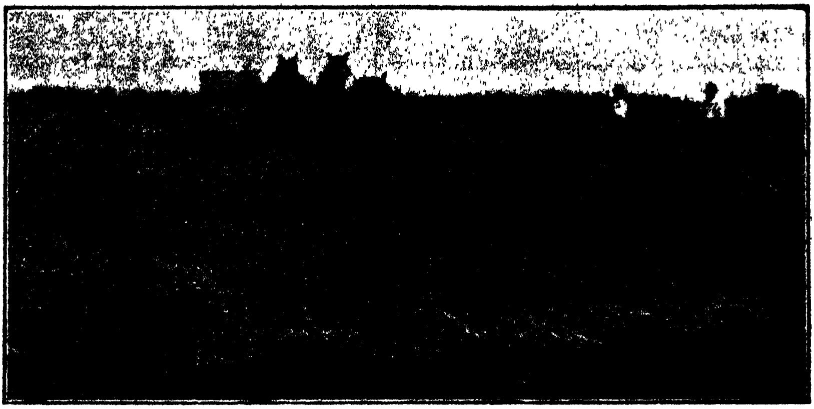
(1) Variety trial.
(2) Watering test (stagnant and slowly changing water).
(3) New land *v.* land previously cropped to rice.

The experiment was conducted on the same farm as last year. The land consisted of a very heavy red clay type of soil, the clay being very near the surface. With the exception of that portion sown with rice the previous season the land had been planted with fruit trees, the orchard being subsequently abandoned, and the land had not been worked for a number of years. One may thus class it as new land, or new land so far as rice was concerned.

The winter of 1923 was exceptionally wet, resulting in a great portion of the plot being under water for a considerable time, with the result that preparation of the land was greatly delayed, ploughing not being carried out until September. As might be expected, very poor work resulted from ploughing such land, and as seeding-time was rapidly approaching an ideal seed-bed could not be obtained, and very little work was put into the preparation of the land.

The check banks were put in by first ploughing together four furrows with an ordinary plough—a disc plough would have been preferable—and then running a road grader along the banks to crowd up more soil, both to raise the height and to strengthen the banks. Good checks were thus produced. It is found that if broad banks are made machinery can cross them without injury, also that less labour is required to maintain the banks after the water has been put in the bays.

In the variety and watering trials the seed was sown on 4th October, 1923, the land not having been previously irrigated. The balance of the land was watered and cultivated, owing to its hard and lumpy surface, trouble being



Harvesting Rice with a Stripper at Yanco.

experienced in getting a good cover for the seed. The second sowing was carried out on 15th October. Following the seeding, which was at the rate of 110 lb. per acre, the land received two waterings to assist germination, the first seedlings coming through about a fortnight after sowing. A very satisfactory germination was obtained.

Cleaning Rice with a Winnower at Yanco.

The crop received several waterings before it was finally inundated, and the water was then kept to a height approximating 5 inches. The water was put on permanently thirty days after the young plants appeared. The

first panicles appeared in the Colusa variety about the second week in January. A start was made to drain the water off the plots on 4th March, those on which the Colusa variety was growing being first, shortly followed by the Queensland varieties and Caloro. By the end of March most of the plots were dry or had just finished draining, and stripping was commenced on 31st March.

Last season the header and combined harvester were used in harvesting the crop. The first machine was again tried this season, but its success was not as apparent as last year, owing to the conditions. A few days before stripping a fall of rain occurred, which left the land wet in places, and also toughened the crop to such an extent that the machine did not thresh out all the grain, a little going out over the "walkers." The wet patches also made the use of such a big machine unsatisfactory.

Rice on Yanco Irrigation Area.
The second crop on the same land.

An ordinary damp-weather stripper was then tried in the crop, with very satisfactory results. This machine required less horse strength, and also, owing to its smaller size, was much easier to handle on the small areas. It threshed the crop very well, and when the grain was winnowed afterwards a very fine sample was obtained.

Although the season was less favourable to growth than the previous one, and the rice sown a few days later, the crop was taken off about a week earlier than last year, a fact for which the acclimatisation of the seed may be accountable.

The Variety Trials.

The variety trials embraced the three American varieties grown last season (local seed), four Queensland strains (usually grown under upland conditions), and five kinds obtained from Java. The American varieties again proved their suitability to the area, producing to 119½ bushels per

acre. The Queensland varieties gave from 28 to 66 bushels per acre, that returning the lowest yield only coming into ear after the water was drained off. The Java varieties were a total failure; they made very good growth, attaining a height of 3 feet, but they did not mature.

The cold snaps experienced during the summer had a very detrimental effect on the Java and Queensland varieties, as very early in the season, following a cold spell, the leaves turned quite brown, the former group remaining in that state, while the Queensland plants were of a pale yellow colour. The panicles of the Queensland varieties were very much smaller than on those grown from the local seeds. The quality was also inferior to the American strains.

A Crop of Watarlbune Rice at Yanco.

Watering Test.

Two bays sown with Colusa variety constituted a watering test. On one the water was continually moving, while on the other it was only added to as required to keep it to the correct level. Thus, in the first instance it may be said that the water was slowly changing the whole time. It may be mentioned here that with this one exception all the bays were only given water to keep to the level desired, no outlet being provided to enable any of the water to be replaced. Both bays in this trial appeared to do equally well, and from appearance there did not seem any choice, but the bay on which the water was only added to gave the highest yield. On these soils, and with the water as supplied here, there appears to be no occasion to have slowly changing water in the bays, occasional replenishing appearing to have satisfactory results.

New Land v. Land Previously Cropped to Rice.

An area approximating an acre, which was sown with rice last season, was sown with the variety Caloro for comparison with land that had not previously been cropped to rice. Although the return from the former land was not as heavy as that from the latter, satisfactory results were obtained. Similar amounts of seed were used on each plot, while in other countries it has been found that with each succeeding crop of rice on the same land the amount of seed should be increased. Doubtless, if this procedure had been followed in this case, a heavier crop would have resulted.

The weed trouble also showed itself in the bays of old land. This calls for attention in the way of experiments for weed control by cultural or watering methods Doubtless the growth of the weeds also tended to reduce the crop.

One bay sown to rice during the season 1922 was not ploughed for sowing in this trial, but owing chiefly to the mild winter during 1923 the roots threw up a young growth; a ratoon crop was thus obtained, giving a yield of 55 bushels per acre, which should be considered very satisfactory, as no work was put into the crop (except to let a little water on to the bays and to take off the crop). As might be expected, the weeds made a good growth on this plot, but they occasioned no trouble in the stripping.

VARIETY Trial.

	bus.	lb.		bus.	lb.
Wataribune	119	38	Tamasari	61	4
Caloro	110	26	Owari	52	36
Colusa	87	27	Kerishima	28	22
Sensho	66	5			

MATURING Test.

	bus.	lb
Stagnant water	87	27
Slowly changing water	82	30

NEW LAND *v.* Land Previously Cropped to Rice.

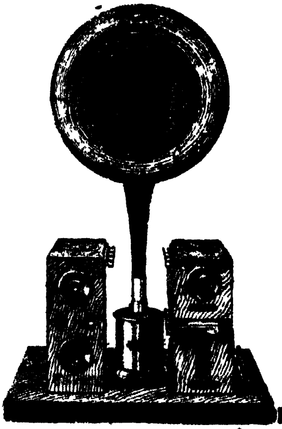
	bus.	lb.
New land	108	41
Old land	83	21
Ratoon crop	55	22

Conclusion.

From the trials of the last two seasons sufficient proof should have been obtained that the growing of rice on the heavy clay lands is worthy of consideration by the careful farmer. Like most other classes of farming, the careless man is going to have disappointing results—if not in the first year, then in the succeeding seasons—from weed trouble.

The Water Conservation and Irrigation Commission is now giving the matter of financing further trials consideration, as well as the carrying out of a commercial test over a larger area.

The three varieties obtained from America are the three standard early, midseason and late varieties. It has been found advisable that farmers should aim at growing the latest maturing variety that his district will permit, as by so doing the heaviest returns are obtained. The later-maturing varieties are usually heavier yielders than the early ones.



Farmers' Experiment Plots.

POTATO TRIALS, 1923–24.

Upper North Coast.

W. R. WATKINS, Agricultural Instructor.

POTATO trials were carried out in co-operation with the following farmers :—

T. Hannah, jun., "Cora Lynne," Lawrence.
H. Johnson, Condong, Tweed River.
F L. Playford, "Merrylands," Nana Glen.
M McBaron, "Riverview," Raleigh, Bellinger River.

The season proved disastrous for the potato crops of the Upper North Coast, a practically dry winter being followed by very dry weather until December. The majority of the crops in the district (at Condong, Lawrence, and Nana Glen) were ruined during the early stages of growth by being attacked by grubs, which cut the plants right back to the ground, and in face of the dry weather very few crops recovered. The Raleigh plot, however, was not attacked, and this may be said to furnish the only comparable results.

The rainfall at the various centres was as follows :—

Month.	Nana Glen.	Condong.	Lawrence.	Raleigh.
1923.	Points.	Points.	Points.	Points.
July	......	......	0	......
August	170	325	190	128
September	72	167	40	182
October	54	53	105	203
November...	22	......	......	58
Total	318	545	335	571

The Plots.

Lawrence.—Black alluvial loam; previous crop, maize. Plots planted on 20th July in drills 3 feet apart, 12 inches between sets and 5 inches deep. The variety trial was manured with superphosphate at the rate of 2½ cwt. per acre. The land was ploughed twice, and after planting was harrowed. Plots were scuffled twice, hilled 17th September and scuffled once after. Dug 3rd November owing to haulms being eaten by caterpillars.

Condong.—Fertile alluvial loam; previous crop, wheat and oats for green feed. Planted 8th August in drills 3 feet apart, 12 inches between sets and 4 inches deep. Variety trial manured with superphosphate at rate of 2½

cwt. per acre. Land ploughed July and again when planting, harrowed twice after planting, scuffled 17th September and hilled 1st October. Dug 31st October, haulms being eaten by caterpillars.

Nana Glen.—Light reddish-brown clay loam; previous crop, maize with field peas between rows. Planted 10th August in drills 2 feet 9 inches apart, sets 15 inches apart and 4 inches deep. Variety trial manured with superphosphate at the rate of 2½ cwt. per acre. Land ploughed in June and again at planting, harrowed after planting and again when plants were showing, scuffled 17th September, hilled 3rd October and scuffled 26th October. Dug 22nd November, owing to caterpillar attack.

Raleigh.—Fertile alluvial loam; previous crop, wheat and oats for green feed. Planted 1st August in drills 2 feet 9 inches apart, sets 14 inches apart and 5 inches deep. Variety trial not manured. Land ploughed twice and harrowed after planting and again when plants were showing. Dug on 11th December.

Two plots of Early Manhattan were planted at this centre—one on land where vetches had been turned under, and the other on land on which cowpeas had been used as a green manure crop. Both plots gave good yields, the cowpea plot giving an increase of about 1¼ tons per acre over a plot planted on unprepared land.

Early Rose yielded well, the tubers being of good even size. Satisfaction also yielded well, but Up-to-date had a large percentage of unmarketable tubers. Factor did fairly well, but Arran Chief failed to make up, the tubers being small and only a few under each top.

The end of the block on which the manurial trial was carried out seemed to vary a little as regards soil, as it set hard and there was a considerable difference between it and the end that gave good results.

The rainfall was well distributed over the growing period, and the crop was clean, no Irish Blight showing.

RESULTS of Variety Trials.

Variety.	Nana Glen (sown 10 August.)	Condong (sown 8 August.)	Lawrence (sown 20 July.)	Raleigh (sown 1 August.)
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Early Manhattan	1 19 3 25	2 18 3 20	1 6 0 3	7 10 0 0
Factor	2 14 0 2	3 4 3 8	1 6 2 2	5 7 0 16
Early Rose	2 8 2 13	......	......	8 11 1 20
Arran Chief	2 11 2 19	......	Unmarketable.	2 16 3 4
Satisfaction	2 6 1 23	2 9 0 12	1 3 0 9	7 3 2 8
Early Manistee	......	2 15 0 0	1 6 0 3	......
Up-to date	......	......	......	3 13 3 20

RESULTS of Manurial Trials.

Fertiliser per acre	Nana Glen (sown 10 August.)	Condong (sown 8 August.)	Lawrence (sown 20 July.)	Raleigh (sown 1 August.)
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 2½ cwt. ...	1 17 3 7	3 10 2 24	1 7 0 11	3 8 2 8
Superphosphate, 5 cwt.	2 14 0 2	3 6 3 4	1 6 0 3	3 3 0 24
M7, 3¾ cwt.	2 3 0 25	2 18 3 20	1 1 0 13	2 16 3 4
P9, 2 cwt.	......	3 0 3 16	1 1 2 12	......
P9, 4 cwt.	2 11 2 19	......	......	4 2 2 0
P7, 2½ cwt.	1 13 2 0	2 17 3 12	1 9 3 23	4 2 2 0
No manure	0 16 0 23	2 18 3 20	1 9 3 23	2 11 1 20
Greatest increase due to fertiliser	1 17 3 7	0 13 3 4	No increase	1 11 0 8

The mixture M7 consists of superphosphate 10 parts and chloride of potash 3 parts. P9 consists of superphosphate 10 parts, chloride of potash 3 parts, and sulphate of ammonia 8 parts. P7 consists of equal parts of superphosphate and bonedust.

At Nana Glen and Raleigh the variety used was Early Manhattan; at Condong and Lawrence, Factor.

The results of the green manurial trial at Raleigh (sown 1st August) were as follows:

	t.	c.	q.	lb.
No green manure .	7	10	0	0
Vetch land . ..	7	15	1	12
Cowpea land .. .	8	13	3	8
Greatest increase due to green manure ..	1	3	3	8

MANUFACTURE OF HOME-MADE OR DAIRY BUTTER.

PRESUMING the cream and a hand churn is available, let the cream ripen until it is sour to the taste, then put it in the churn at a temperature of, say, 55 deg. Fah. The air vents should be opened after the first few revolutions to let off gas, and this should be repeated three or four times at half-minute intervals. Revolve the churn or turn the beaters so as to agitate the cream for about 30 to 35 minutes. The glass on the churn should then show slight signs of washing clear; add a little cold water to the cream, taking the lid off the churn to do so. Having added water, say one pint to a gallon of cream, set the churn going again until butter is in granular form about the size of shot; open the drain taps and drain off the buttermilk. Add cold water until the butter grains float freely; revolve the churn for half a minute and drain off; add a fresh lot of water, revolve again and also drain this off. This wash water should come away clear or with just a very faint milky tinge.

Now take the butter out of the churn and add fine powdered salt at the rate of about ½ oz. to 1 lb. of butter. If mildly salted butter is desired, add a little less than this; if a distinct salt flavour is desired, add a little more, but do not exceed ¾ oz. Work the salt thoroughly through the butter with pats, touching it as little as possible with the hands. A small roller worker can be purchased for this purpose. Let the butter stand for at least six hours so that the salt may melt thoroughly, then re-work for about five minutes, taking care not to work too much, or it may become greasy.—L. T. MACINNES, Dairy Expert.

Disposal of Butter Factory Sewage.

Almost all dairy produce factories situated away from tidal streams are faced with the difficulty of the satisfactory disposal of factory sewage. Years ago it was determined that the septic tank was useless for dealing with this form of sewage, and that the only method approaching satisfaction was the pumping of all sewage as far away as possible from the factory premises. While this is still the most satisfactory method of disposal, owing to the location of the factories it is not possible in all cases, and the sewage has to be distributed over ploughed ground very close to the factory building.

It is most difficult to spread sewage evenly so that the ground will not become water-logged, or coated with the greasy substance so common in this sewage. The ground also often becomes so saturated with moisture that it is impossible to loosen or break the surface again for quite a long time, and without regular ploughing or stirring of the surface earth more or less foul odours soon develop. Apart from the possibility of introducing infection and fouling the atmosphere surrounding the factory, residents in the neighbourhood may complain and give the management anxiety in attempts to abate the nuisance.

To overcome these objections, experiments have been carried out at several factories with a system of spraying the sewage over ploughed ground with marked success. All butter-wash water and the usual factory sewage is satisfactorily disposed of in this manner. To secure the best results the ground requires to be well ploughed and harrowed, and if of a heavy texture it is advisable to loosen the subsoil by a number of charges of gelignite. A sewage sump is necessary, and the sewage should be strained as it enters the sump. This must be done to prevent the spray nozzles becoming choked up with the particles of shavings or other matter.

A serviceable steam pump is used for pumping the sewage through a 1½-inch pipe to the centre of the ground. At this point a piece of flexible hose connects this pipe to a piece of moveable pipe of similar diameter. The hose permits the moveable pipe to be swung round to another position when required, or to be temporarily removed when the surface soil requires fresh ploughing or harrowing. The moveable pipe is provided with spray nozzles at intervals of 8 or 10 feet, but for greater efficiency, branch pipes, 4 to 5 feet long, may first be attached perpendicularly to the moveable pipe, and the nozzles screwed into the upper ends of these pipes. It has been found that the extra elevation of the nozzles enables the moisture to cover a greater area. To maintain the nozzles in an upright position the moveable piping should be permanently attached to small brackets, so that with an alteration in the position of the pipe the brackets will also move with it. With a slight breeze blowing when spraying, a very large area is lightly covered with moisture—so lightly that if necessary the surface can be almost immediately harrowed. In hot weather much of the spray disappears in the air by evaporation, which is another advantage of the system.

The sewage should be delivered to the spray nozzles by the pump with considerable force to obtain the finest spray possible.

It is also necessary to have the nozzles attached to permit of easy and quick removal for cleaning when necessary, but the necessity for cleaning can be greatly reduced if care is taken to keep the sewage as free as possible from floating matter when entering the sump.—O. C. Ballhausen, Assistant Dairy Expert.

The Prevention of Parasitic Infestation.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.

AMONG the causes of the heavy mortality that occurs among stock in this country at times, parasitic infestation occupies a very important place, and yet the loss in actual deaths is only a small proportion of the monetary loss for which parasites of livestock—both external and internal—may fairly be blamed. A heavier loss arises from actual loss in condition, decreased value of wool, lessened milk and meat production, weak and unthrifty lambs, and so forth.

It is perhaps on the tablelands that the most serious effects of parasitic infestation are seen, but the moist coastal regions suffer, and the western slopes are not exempt. Only in the dry western areas is this a neligible cause of loss. All classes of livestock are affected, and neither breed, age, nor sex renders an animal immune to the ill effects of the parasites, although these effects are far more marked in young animals.

It is possible to lay down general lines which can be followed with some success if the procedure is modified to suit the varying conditions of stock-raising, and also to fit in with the life histories of the various parasites, but to do really satisfactory work it is necessary to study each case on the ground, and to determine what are the parasites to be fought against. The time will no doubt come when, the country being closely settled and more developed, the go-ahead farmer, noticing some falling off in the condition of his stock which he considers is due to parasites, will call in his veterinary surgeon—a highly trained veterinarian, who has been induced to settle in the district by the farmers themselves, and who is entirely at their disposal. But that day is yet a good way off, and less systematic methods must serve in the meantime.

The Water Supply.

If infestation of stock by parasites is suspected, the first measure to be considered is the prevention of infestation through the water supply. Moisture is essential to the development of nearly all internal parasites, but it must not be excessive. The embryos of the stomach worm of sheep, for instance, do not float in water, and fairly deep pools are not dangerous unless the water is much stirred up; but marshy ground and the edges of shallow pools offer the most favourable conditions for the development of this worm. The fluke requires a snail in which to pass portion of its life, and these snails are naturally most prevalent in the neighbourhood of pools and on moist ground. Several other of our most serious parasites also prefer marshy ground for their development. It is thus evident that watering of stock from troughs into which the water is pumped from wells is the safest method of dealing with this source of infection. Obviously, however, such steps are

a waste of time unless swampy patches and shallow pools are fenced off Unless a well is receiving surface contamination, the water in it will be free from embryo parasites or eggs.

Closely associated with the improvement of the water supply is the proper draining of the land. It will be understood from the foregoing that land which is continuously in a moist condition provides exceptionally favourable conditions for the multiplication of parasites, and consequently one of the beneficial results of the drainage of swamps is a reduction in the number of parasites. Drainage is of great importance in connection with pigs, among which much of the mortality is directly or indirectly due to intestinal parasites. Very often one finds the pig pens placed on the lowest part of the farm, and in such a position that the surface water, instead of running off, soaks slowly away. If the pig yards are placed on a good slope, not only will the surface become dry more quickly, but the actual washing given by heavy rain will remove many embryos and eggs, and prevent further infestation.

On large holdings where a comparatively extensive area is required for a few animals, the danger of infection in connection with food and water is minimised, but the smaller the holding and the greater the carrying capacity, the greater the danger. This danger is naturally increased by overstocking, particularly if the overstocking is carried on for a lengthy period. The ill-effects of parasitic infestation thus assisted, naturally become greater if, from want of food, the animals become low in condition.

The Influence of Food.

This consideration raises the question of the influence of food on infestation by parasites, and still more on the ill effects of such infestation. It is doubtful if any single factor will do more to counteract internal parasites and their effects than good feeding. It is well to remember that the quality of the food, and not the quantity, is the important item.

Closely associated with this aspect of the question is the best utilisation of grazing land. Undoubtedly from the anti-parasite point of view the subdivision of paddocks is the best course, particularly if each subdivision can be spelled in turn. It takes a consiberable time for all the parasites in a field to die, but the longer the paddock is left free from stock, the fewer will survive. It is not necessary that paddocks so spelling should be left entirely empty, for, supposing a paddock to have become badly infested with sheep stomach worm, horses can be grazed thereon quite safely; in fact they will do much good, for they will swallow innumerable worm embryos, which will be killed with no harm to the horses. In the same way pigs may safely follow sheep, and sheep may follow pigs.

In order that a proper supply of food should be available for farm stock, it is becoming more and more essential to combine agriculture with grazing, and this combination can be made to play its part in lowering the number of parasites present. Supposing a cereal crop to have been harvested and

wormy sheep to have been put on to eat the stubble and weeds; the sheep will deposit large numbers of worm eggs on the ground, but it will be ten days to a fortnight before any of the eggs hatch and become sufficiently developed to re-infest the sheep to any extent. If the sheep are removed and the paddock is then ploughed, the embryos will be turned under and destroyed, and when sufficient growth has developed stock can again be turned in for a similar period.

Occasionally useful work can be done by burning off paddocks, particularly after wormy sheep have been on them for some considerable time, large numbers of embryos being destroyed by the fire.

Associated with the feeding of stock to prevent the ill-effects of worm infestation is the supply of suitable licks. Salt licks maintain the health of sheep, and may be suitably combined with sulphate of iron and bone meal, and the supply of the last constituent will do something to counteract the drain of phosphates from the soil.

Medicinal treatment by means of drenches is rather a means of dealing with parasites already present than a preventive, but there is one point in connection with their use which it is as well to stress: they should be used early.

All the measures suggested may not be applicable to all cases, but some at least can be utilised everywhere, and by their universal adoption, and concerted action among stockowners, the loss caused by parasites could be minimised. As closer settlement proceeds, these methods of prevention will be capable of more general application, and it should be possible to look forward to better control in the future.

THE VALUE OF COLOUR IN MILK.

COLOUR in milk is a point of some commercial value, says F. J. Doan, of Maryland Agricultural Experiment Station, in the *Journal of Dairy Science*, the average consumer preferring a yellowish milk, thinking it to be richer in cream (butter-fat) than whiter milks. While this is true in general of milks where the pigmentation of the fat is approximately equal, it does not hold in the majority of cases. The demand for yellowish milks should, however, be encouraged for quite another reason.

It was at one time suggested that carotin and fat-soluble A vitamin were identical, or at least were always found associated. While this theory has been disproved, it is still a fact that milk from cows fed on ample quantities of green vegetation is higher in vitamin content than milk from cows fed on bleached hays, silage, most roots, and grains. Thus it follows that summer milk is richer in vitamins than winter milk under prevailing American and European conditions of production

In a final analysis, says this writer, it may be found that the colour of cows' milk or the colour of milk fat is of no great importance, but from our present knowledge colour does seem to be an indication of the vitamin A value of milk used for a food, and possibly an indication of the presence or absence of other vitamins as well. This statement applies only to milk produced under the conditions referred to.

"Uses of Waste Materials."

The purpose of this monograph, we are told, is to show in detail all that has been done in different countries during the war and since for the utilisation of the by-products of industry, and of offal and residues of all kinds, for the manufacture of products suitable for the food of man and livestock, and for the preparation of various fertilisers.

The author, Prof. Arturo Bruttini, has apparently prepared his work in connection with one of the inquiries set up by the International Institute of Agriculture at Rome, and the book is now published as one more of the very useful series of that institute.

A vast variety of waste material acquired an additional value by reason of the stress imposed by the war, old processes being suddenly adopted on large scale in some cases, new applications of old methods being made in others, and entirely new processes, often very ingenious, were employed in yet others. Numerous publications have dealt with these processes and methods, but this particular work aims at making known to agriculturists and others the most important inventions or applications.

The work opens with an account of the measures adopted by various governments for the utilisation of waste products as food for men and animals, and as fertilisers, and then in separate sections deals with the methods adopted for the production of human food from waste, of feed for livestock, of fertilisers, and of alcohol, essential oils, and other industrial products.

The book is largely one of reference no doubt, but such a systematic collection of material cannot but be suggestive in the hands of technicians. If a more scientific and intensive utilisation of waste material could be achieved, it would mean a saving of many millions of wealth to mankind.

[Our copy from the publishers, P. S. King and Son, Ltd., Westminster.]

The Feed Factor in Dairying.

The value of better feeding methods in relation to dairying is referred to in a letter received from Mr. Geo. H. Walker, of Wollongong. "For upwards of fifteen years," he says, "I have kept a cow for household use, but have never considered the question of a balanced ration until I read the article by Mr. A. H. Haywood in the April, 1923, *Gazette*. For years past I have been content to get enough milk for daily use, but the article determined me to try the ration quoted, consisting of maize (cracked) 30 lb., bran 20 lb., oats (crushed) 10 lb., and linseed meal 5 lb., feeding 1 lb. of this mixture daily for every 4 lb. of milk yielded."

This ration was supplemented with a kerosene tin of chaff at each meal, and maize meal was used instead of cracked maize, as the cracked maize was passed undigested, probably owing to lack of roughage. The cow (a pure-bred Jersey on second calf) was confined to an allotment of 200 feet square.

From 7th June, 1923, to 6th March (273 days) she yielded 6,266 lb. of milk, and although butter-fat tests were not carried out sufficiently systematically to have great significance, the results of the experiment have been so satisfactory to Mr. Walker that he has advised several progressive local farmers to set aside two or three cows and to feed them according to the recommendation quoted, their performances to be subsequently compared with those of selected cows fed under usual conditions.

The Brown Vegetable Weevil.

[*Listroderes* (*Desiantha*) *nociva*].

T. McCARTHY, Assistant Entomologist.

THIS destructive pest was hitherto known as the Buff-coloured Tomato weevil, as well as by other local names such as the "carrot weevil," &c. The name Brown Vegetable weevil has been adopted by the Entomological Branch as preferable, however, because it gives a better conception of the general colour and eliminates the name "tomato weevil" as being too circumscribed and misleading in view of the greater number of host plants now known.

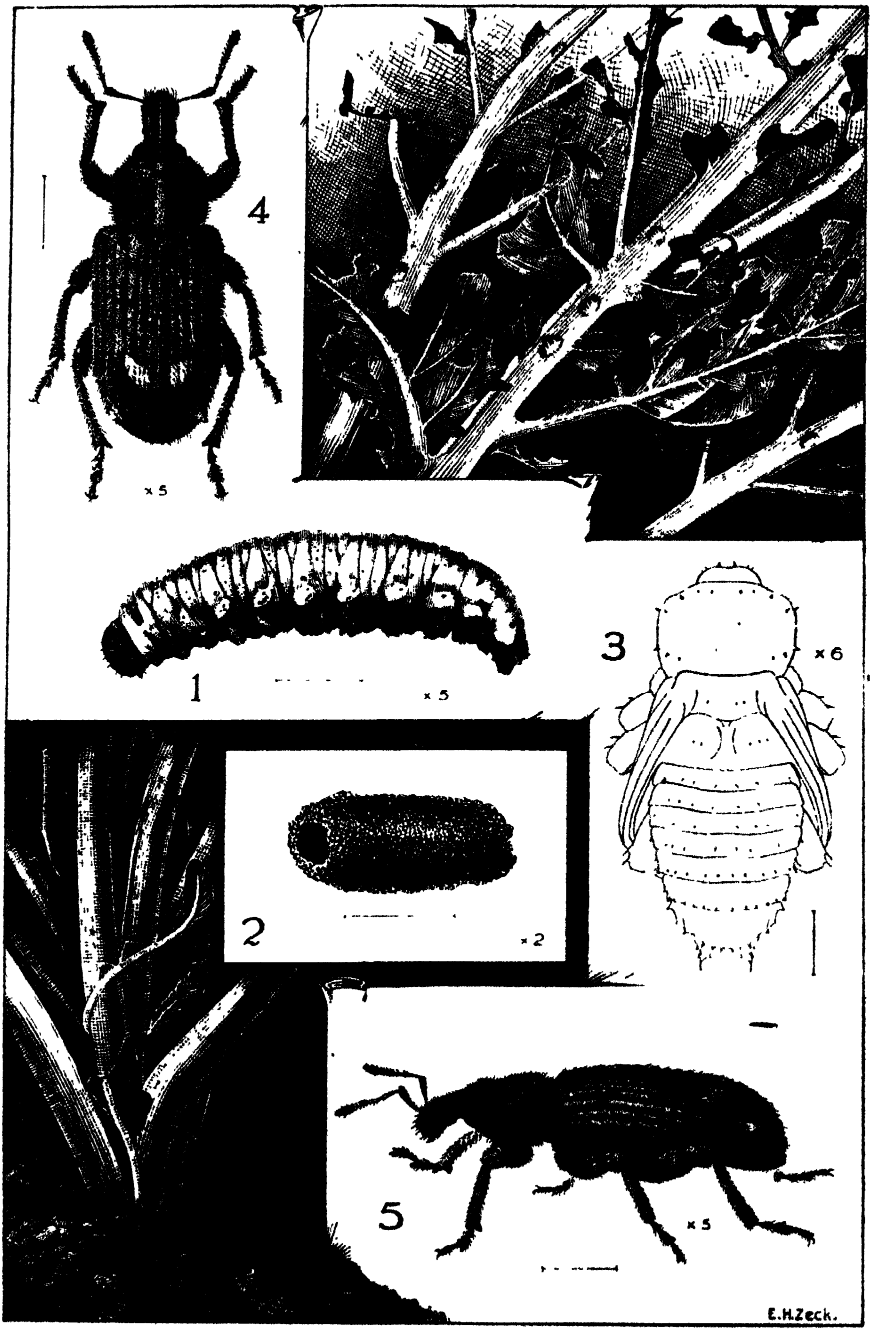
This weevil was first recorded as a pest in Australia in 1905 by C. French, junior,[1] who reported it as very destructive to tomatoes, cabbages, and other vegetables near Melbourne, Victoria. From specimens forwarded by him to A. M. Lea, the latter[2] technically described and named it is *Desiantha nociva.* It was figured and briefly described by French[3] in 1911, and in 1915 a short description of it was given by W. W. Froggatt[4] under the name of the Buff-coloured Tomato weevil.

In 1922 it was first recorded in the United States (in Stone County, Mississippi), and a preliminary account of it was published in the year 1923 by Chittenden[5] under the heading of the Australian Tomato weevil. Its occurrence was also reported by Harned[6] about the same time, and in January and April, 1923, notes on its habits and control were published by E. K. Bynum.[7,8]

Some doubt has existed as to the exact generic position of this species, but competent authorities are now of the opinion that it does not belong to the genus *Desiantha.* In this account I will refer to it as *Listroderes nociva,* based on the authority of Dr. Guy A. K. Marshall, Director of the Imperial Bureau of Entomology, London, who in a letter to Mr. W. B. Gurney, Entomologist of New South Wales, concerning this pest writes as follows:—

> "This weevil has nothing whatever to do with the genus *Desiantha,* but belongs to the South American genus *Listroderes,* and I have found in the British Museum a specimen of a species from Brazil with which it is probably conspecific. I have quite recently received the same species from South Africa, where it is attacking turnips."

Fifteen species have been described in Australia under the genus *Desiantha.* Lea himsel, in placing certain species in that genus, realised clearly that they possessed some characters at variance with it, and mentioned (*Trans. and Proc. Roy. Soc., S. Aust.,* Vol. 23, Part 2, 1899, p. 138)



The Brown Vegetable Weevil [*Listroderes (Desiantha) nociva*].

1.—Larva.
2.—Earthen pupal cell.
3.—Pupa.
4.—Adult Weevil (dorsal view).
5.—Weevil (side view).
6.—Stem and leaves of potato damaged by weevils and larvæ.

that it may eventually be considered necessary to erect a new genus to receive these. In the same *Transactions,* page 140, under the description of *Desiantha præmorsa,* he writes as follows:—" A peculiar species which might be separated from *Desiantha* on account of the unique structure of the rostrum."* Again, in the same *Transactions,* Vol. 33, p. 178, under his description of *D. nociva,* he refers to the resemblance of the rostrum to that of *D. præmorsa.* It seems reasonable to conclude, therefore, that a revision of the Australian species described in the genus *Desiantha* may prove that at least one species, *Desiantha præmorsa,* is congeneric with *Listroderes,* and perhaps lead us to a more definite opinion as to whether *nociva* is a native or an introduced species to Australia. As yet there is no evidence whatsoever as to the origin of this pest in Australia. Its presence in South Africa is of interest, as that country possesses geographical and commercial features in relation to Australia which make the introduction of an insect pest from there much easier than from South America.

The preference of the pest also for the common Cape weed (*Cryptostemma calendulaceum*), as recorded further on, is also of interest, as the Cape weed is an introduced plant from South Africa.

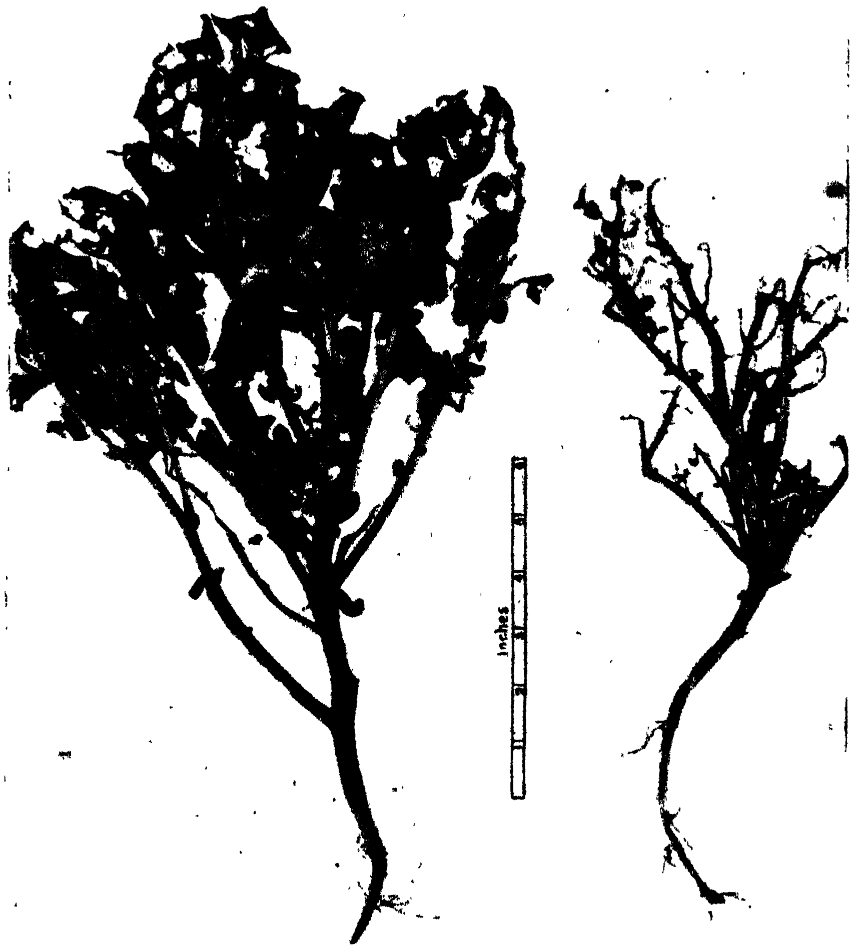
Up to the present the Brown Vegetable weevil has received no attention in literature except in Australia and the United States. Dr. Marshall states that he has received specimens from South Africa feeding upon turnips. It is also believed to occur in Brazil and other South American countries. In Australia it has been recorded along the southern and eastern coasts, from South Australia as far north as Byron Bay in the North Coast district of New South Wales. During the past eighteen months the writer has kept a record of its distribution in this State, and has recorded it from the following places—Auburn, Canterbury, Campsie, East Hills, Chatswood, West Kogarah, Parramatta, Pennant Hills, Guildford, North Wamberal, Gosford, Wallsend, Adamstown, Taree, Byron Bay, Tamworth, Wollongong, and Brookvale.

Food Plants.

Although there is evidence of the weevil becoming omnivorous in its tastes, potatoes and tomatoes are at present its most favoured hosts as far as cultivated plants are concerned. In addition it has been frequently recorded on cucumbers, beans, carrots, parsnips, turnips, lettuce, and chrysanthemums, and on one occasion the writer found the larvæ feeding on the young tobacco plants in the seed-beds. It is particularly common on Cape weed (*Cryptostemma calendulaceum*), a plant introduced from South Africa into Australia about 1837, and into New South Wales about 1890. This weed grows very abundantly during the winter and spring months, and I have found it very heavily infested both with larvæ during midwinter and with adults during October. In fact it appears to be the favoured host, and adults fed in captivity much preferred Cape weed to either potatoes or tomatoes.

Nature of the Injury.

Injury to the plants is caused at both the larval and adult stages, although that done at the latter is much more serious. The larvæ when small are usually found on the under surface of the leaves, and at this stage do not eat entirely through the leaves, but as they increase in size they make large irregular holes in the leaves. The adults appear to be even more destruc-



Potato Plants partly and wholly denuded by the Weevil.

tive, and in an incredibly short time are capable of totally destroying the plant, leaving only the leaf stalk, as is seen in the illustration on this page. When in considerable numbers even the stalks may be devoured. Where the beetles are abundant a plant may be thus destroyed in two nights. The beetle sometimes attacks the plant underground, and large irregular holes may be eaten in such vegetables as carrots and turnips.

Description of the Various Stages.

The larva when full grown is about 11·5 mm. in length. On first hatching it is yellowish white in colour, the head is black, except with transmitted light when it is dark-brown, and the thoracic plate, which is also black, is much more prominent than in the later larval instars. The colour, however, gradually changes to a translucent pale green when the larva is about one-third grown, and this is the normal colour of the fully developed larva. The head and thoracic plate has also become brown in colour, and the dotted lines on the head have also appeared. Unlike the more familiar stout fleshy grubs of the weevils, the fully developed larva is more slender in form, with the segments uniform but tapering slightly towards the ends. When observed by the writer feeding upon Cape weed during the day, the larva with its pale green colour resembled in a general way the larvæ of some of the leaf-eating beetles of the family *Chrysomelidæ*.

The larva has all the usual characters of the curculionid larva, but the head is yellowish brown with two ocelli, and a series of darker dotted lines, most of which form fairly regular patterns above the Y-shaped suture on the vertex of the head. The thoracic plate is small, inconspicuously divided in the centre, paler in colour than the head, and with a darker coloured irregular depression towards each of the lateral margins. As is usual with all weevil larvæ, it is legless, but the ventral surface of each segment is provided with a transverse row of four fleshy tubercles which aid it in crawling. On either side of the body, just below the spiracles, are two longitudinal rows of tubercles armed with very short blunt spines. The lower of these two rows apparently enable the grub to maintain its hold on the foliage. There is also a transverse row of very minute spinose granules on the dorsal surface of each segment.

Pupa.—The general outline of the pupa resembles that of the adult. It is about 8·5 mm. in length, with the legs, antennæ, and wing-pads all prominent, and the short broad rostrum extending backwards along the ventral surface of the thorax as far as the tibiæ of the first pair of legs. The head and thorax are light green, but the abdomen is slightly darker, and the rostrum, legs, antennæ, and wing-pads are pale yellow. There are two dark brown stiff spines close together on the vertex of the head. Between these and the eyes are four similar spines, the two placed nearer the eyes being much wider apart and almost on the lateral margins. Between the eyes are four more spines, and further on toward the apex of the rostrum two more with another pair on the apex itself. Similar spines exist on the thorax and abdomen, eight dorsal segments of the latter being visible. When disturbed in its earthen cell, the pupa becomes very active, and by rapidly rotating the abdomen can turn the whole body round and round. As the time approaches for the adult to emerge no distinct change occurs except that the eyes become prominent, and the rostrum, legs, and antennæ become light reddish brown with a speck of a darker colour on their distal ends. In captivity the pupal stage occupies twelve to fourteen days.

The Adult.—On emerging from the pupa the adult is quite soft and yellowish grey in colour, but owing to the presence of small patches of

darker scales on the elytra it has a somewhat mottled appearance. At this stage there is no appearance of the whitish stripes on the elytra. The ventral surface of the abdomen still retains the light-green colour of the pupa. The eyes are black. After remaining within its earthen pupal cell for a few days until it hardens and assumes its normal colour, the beetle emerges by making a small circular hole towards one end of the cell, as shown in the accompanying illustration.

The adult is a typical weevil, with its short, stout beak bearing the usual elbowed antennæ, clubbed at the tips. The jaws, with which it does the damage, are situated at the extreme end of the beak. The pro-thorax is wider in front than behind, and the elytra bear two small tubercles on the declivity. The upper surface of the thorax and the elytra are densely covered with grey to brown scales interspersed with small scattered patches of black scales, giving the insect a greyish-brown appearance, which affords it excellent protection when resting motionless among the clods of earth.

There is a medium line of brownish-white scales on the thorax, and a less conspicuous row of similar scales on either side of the line on which the elytra join. Two oblique patches, consisting of whitish scales, also occur on the elytra, forming, roughly, a V-shaped mark. This, however, is not characteristic, as a similar mark also occurs on the allied Australian species *Desiantha præmorsa*, also described by Lea. The elytra also bears impressed lines or striæ, each interval being set with an irregular row of black or white setæ. The under surface of the body, legs, beak, and antennæ, except the club (which is darker), are reddish-brown, but thickly clothed with stiff hairs, giving a greyish-brown appearance when seen without a lens.

Habits.

Feeding in the adult stage invariably occurs at night. In captivity they become active usually about 4 o'clock in the afternoon, but this activity might be accounted for by the comparative darkness of the breeding cage in which they were confined. The larvæ also feed mainly at night, but some have been observed feeding during the day. The adult weevils shelter during the day in the soil surrounding the plants, between and under the clods and beneath debris, these being the places where they are most usually found. Larvæ nearing maturity have also been found beneath the soil during the day, but in large masses of heavily infested Cape weed all the larvæ were observed to remain on the plants, resting alongside the mid-rib or partially hidden in the curled portions of the leaves. These larvæ were mainly small to half-grown. At times the beetles become very numerous, as will be gathered from the fact that the writer took 102 weevils from below two small potato plants 3 inches apart, the ground being examined within a radius of 8 inches from the stems of the plants. When disturbed the beetles themselves feign death, and because of their colour resembling that of the soil they are often difficult to detect. Later, however, they become active, and seek shelter, crawling somewhat quickly over the soil. In a series of tests on a level surface to test the rapidity of this form

of locomotion, the beetle averaged approximately 1 inch in 1·13 seconds, so that their spread in the field by walking would be quite appreciable. When exposed to light in front of a window during the day the beetle walked in a diagonal direction towards it. Attraction to an artificial light at night appears to be fairly considerable. The writer observed them escaping from a jar in the laboratory and flying quite readily over a wooden partition to a 50 candle-power electric bulb some 30 feet distant, and circling many times around it before dropping to the ground or alighting on the wall. It would appear, however, that their power of flight is not availed of to any great extent in spreading over a field, as the following shows:—A field of potatoes adjoining an orchard that was heavily covered with Cape weed, in which the beetles had developed and were feeding, was attacked immediately the Cape weed was removed, the potato plants being destroyed row by row, beginning with the one nearest the Cape weed; the advance occurred at about the rate of one row per night, the beetles being in considerable numbers. Our knowledge of the seasonal history of this pest is not complete. The longevity of the adults appears to be considerable, as beetles hatched in captivity on 26th September were still alive on 21st December. No adult weevils were found in the field during winter, but larvæ in all stages of growth, from small to full-grown, were found during midwinter, considerable numbers being collected in the field feeding on Cape weed on 26th June. Of these, larvæ about one-third grown predominated. Small to half-grown larvæ were also found in the field during October. The first adults have been reported during August and September, but they do not become abundant until October and November, which is the period of greatest destruction. After this the beetles become reduced and the damage gradually decreases. Adult weevils were taken in company with *Desiantha præmorsa* and another allied species on 27th March, hiding in a stump. Further evidence as to occurrence of broods is wanted, but that available indicates that there is no marked differentiation of broods.

Control.

Experiments conducted at West Pennant Hills in a field of potatoes heavily infested with the Brown Vegetable weevil show that the weevils can be readily controlled with either lead arsenate or calcium arsenate. The powdered form of either poison is preferred, and can be applied either by spraying or by dusting.

Arsenate of lead powder, applied at the rate of 1 lb. to 15 gallons of water, killed 78 per cent. of the weevils in the sprayed area in two days. Similar areas dusted with arsenate of lead and calcium arsenate powders killed 83 per cent. and 97 per cent. respectively.

On account of its greater killing efficiency owing to its higher arsenic content, calcium arsenate should prove more effective than arsenate of lead. No burning of the potatoes resulted when the undiluted powder was used, and any risk should be overcome with more delicate plants when it is diluted at the rate of 1 part of calcium arsenate to 10 of hydrated lime.

Another useful method, particularly when the plants attacked are small, is to dip the tops of Cape weed, potato, or other food plant that can be easily obtained, in a lead arsenate or calcium arsenate solution, or dust them with the diluted powder after dipping them in water, and place them between the rows of infested plants. This is best done towards evening, as the treated tops remain fresh and attractive overnight when the beetles are feeding.

Clean cultivation is also a factor in the control of this pest. On a number of occasions the infestation has been traced to a thick growth of Cape weed. The destruction of all such weeds should be carried out early in winter. If they are allowed to remain and their destruction is carried out later in the year most of the beetles will escape and migrate to the cultivated area. If such a condition occurs it might be even more advisable to allow the weeds to remain, and thus act as a trap crop.

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"PIG BREEDERS' ANNUAL FOR 1924."

THE fourth volume of the annual production of the National Pig Breeders' Association, England, comprises a collection of articles on pig-farming, chiefly under British conditions, but also touching in several cases the wider aspects of management of this part of farm equipment. Among the subjects dealt with are the keeping of records of production and their use in breeding, animal nutrition, genetics in relation to pig-breeding, the pedigree versus the scrub animal, and so forth. A useful collection of reference tables and statistics is appended, and the volume may altogether be regarded as of some utility to those interested in pig-farming.

[Our copy from the Association.]

The advantages to be gained from dipping sheep are many, and include (1) freedom from "ticks" and lice; (2) a brighter and better fleece; (3) the maintenance of better condition; (4) freedom for a time from the blow-fly; (5) freedom from quarantine.

Root Knot in the Vineyard.

H. L. MANUEL, Viticultural Expert.*

OCCASIONALLY when visiting vineyards in my home State I have come across odd patches of vines showing the effects of an invasion of eelworms. These eelworms, or nematodes, as they are generally spoken of, cause gall-like swellings on the roots of certain plants, of which the vine is one, and it is from these swellings that the term "root knot" has been derived. The effect of the injury upon the plants is more or less serious, according to the conditions under which the plants or vines are grown. In some cases vines recover, in others they remain sickly and practically non-productive, and in others again they die.

There is still much ground to be covered in connection with the subject, and it may be found in the future that we possess certain varieties which are immune or free from serious injury—in other words, resistant to the attacks of the pest.

With irrigation settlement proceeding apace in this country, we may see more of the trouble in the future, for it is likely to be associated with sandy types of soils, as it is soils which remain more or less damp that prove ideal breeding grounds for the pest.

The species of eelworm, or nematodes, are very numerous. Some affect animal life, and others plant life. It may be mentioned here that the "hook worm," which affects human beings, particularly children, in parts of the north of Queensland is one of these nematodes.

In 1855 it was first mentioned in print by the Rev. M. J. Berkeley, who described roots affected by the disease and recognised the animal nature of the organism causing it. In the year 1864 it was observed by Greef on grass roots, and received the name of *Anguillulla radicicola.* C. Muller, of Germany, after a careful study of the organism, placed it in the genus *Heterodera*, under the name of *Heterodera radicicola.*

In England the swellings on roots of ornamental plants attracted the attention of greenhousemen, and later one reads of root knot being found in many parts of Germany, Italy, France, Holland, Austria, Sweden, Russia, Africa, Egypt, &c. It is widespread in India, and to some extent in China and Japan, and the East Indies, Java, and Sumatra, are stated to be badly infested. It is not unknown in New Zealand, and in Australia it has been known to exist for some considerable time, Dr. Cobb, of New South Wales, having mentioned it in 1890.

On the analysis of early reports of root knot it appears that the pest was originally tropical and sub-tropical in its distribution, and that with the general trade in plants to various countries the pest was gradually scattered more or less throughout the world.

* Paper read at Viticultural Congress at Adelaide, 17th June, 1924.

The effects of the presence of root knot become observable when the plants become dwarfed or begin to die, and the disease is often present causing weakness of the vine and ultimate reduction in yield, perhaps without the grower's knowledge of cause. The effect of the nematodes upon the root system is the production of irritation and the formation of galls. The interception of the sap by the eelworms and the production of galls to any extent cause decay of the affected roots, which die back. If the vine is unable to make fresh root growth, and is not in possession of roots in the lower depths of the soil, it will gradually weaken and will ultimately die.

In all the vineyards where I have seen the trouble, it has only occurred in more or less small patches, the affected portions having somewhat the appearance of a vineyard that is first attacked with phylloxera. The growth of the vines becomes sickly and weak, but the trouble extends more slowly. It differs from phylloxera in that dry conditions arrest its progress, and sandy conditions are favourable to it. Phylloxera, on the other hand, favours dry conditions, and soils of a stiff nature are better adapted for its more rapid spread. I cannot recall even seeing vines affected with eelworm growing on soils of a stiff nature.

There are many plants that are susceptible to root knot, while there are many others that can be grown in infested areas without being affected.

Plants Susceptible to Eelworm Attack.

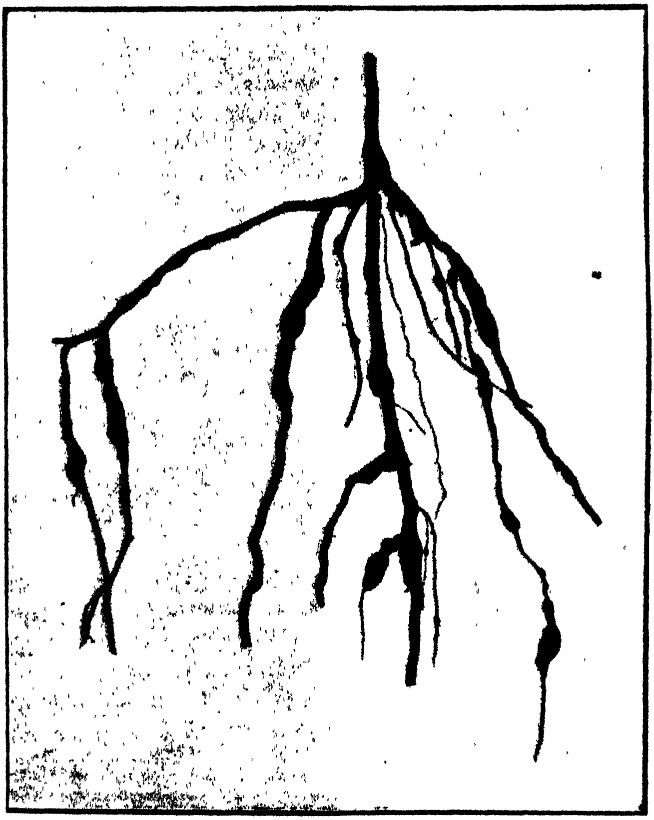
Various observers have prepared lists of affected plants. They may be compiled as follows:—Peach, quince, cherry, hemp, onion, celery, asparagus, beet, rape, cabbage, cauliflower, turnip, watermelon, cucumber, squash, pumpkin, carrot, Jerusalem artichoke, sweet potato, lettuce, vetch, clover (burr and sweet), bird's foot trefoil, white and yellow lupin, tomato, horehound, lucerne, mulberry, tobacco, bean (Lima and French), garden pea, field pea (to lesser extent), raddish, sugar-cane, potato, spinach, strawberry, and and the grape vine.

In his American report, Ernest Bessey states that from his observations the European species of vines (*Vitis vinifera*) seem to be especially liable to injury by root knot, although the different varieties vary greatly in their susceptibility. He states that the muscat family appears very subject, while sultenina (our sultana) is apparently not so easily injured. He mentions that some of the phylloxera-resistant hybrids and pure American sorts are practically immune to root knot, as well as to phylloxera, although some American sorts are quite badly affected by the nematode. Unfortunately Bessey did not, for some reason or other, give detailed particulars of his observations in this respect.

An authority named Lavergue states that the European varieties are very susceptible to the trouble, while those of American origin that are resistant to phylloxera are also resistant to root knot. His remarks regarding resistant stocks do not coincide with my experience, as I can call to mind seeing both the Riparia x Rupestris 3309 and 101-14 affected, and

Mr. H. G. White, Superintendent of Narara Viticultural Station, recently saw some Mourvedre x Rupestris 1202 and Aramon x Rupestris 84·3 affected. Rupestris du Lot has been mentioned as immune from the attacks of the nematodes.

Of the European varieties, I recall seeing a patch of Gordos affected, and also have seen the Hunter River Riesling (or Semillon). Because up to the present time I have not seen many other varieties not affected with root knot, I do not consider the majority of them are immune from attack.



Vine Root, showing Galls caused by Eelworms.

It is more likely that the majority of them have been growing under conditions not suitable for the development of the nematodes in large numbers, or perhaps they may have been growing in soil that is at present free from infestation. On the other hand, it is quite possible and reasonable to assume that certain varieties we are growing will be found not susceptible to attack. However, until further or more definite data can be gathered in the above respect, vinegrowers would be wise to adopt precautionary measures with all varieties, to guard against infestation.

Non-susceptible Plants.

There are many plants which are largely or entirely immune from eelworm attack, among them being—barley, soybean, velvet bean, maize, certain varieties of cowpea (including Iron, Manetta, and Victor), many grasses, millet, oats, peanut, rye, sorghum, and wheat.

Many of these susceptible and non-susceptible plants are used by growers as green manure crops, or, in some cases, as "pot-boilers." Vegetables, such as tomatoes and potatoes, can often be seen on new settlers' blocks, intergrown with young vines. This practice, although it cannot be generally recommended, if not overdone is of great assistance to a new settler who may only possess a very limited amount of capital. In resorting to these measures one should watch for any occurrence of root knot, and if it is observed, should discontinue the practice where possible, or only continue to plant those crops which are immune. One should always aim at a system of starving out the larvæ when indications of their presence are seen, and should eradicate all weeds or susceptible annuals that would provide harbour and food supply for them.

Life History.

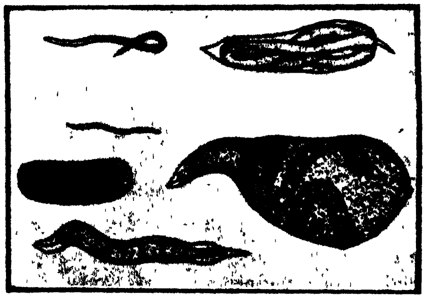
The eelworms, when developed, are about one twenty-fifth of an inch long and with a lens are seen as pearly-white, rounded bodies. The male is thread-like in appearance, the female being somewhat pear-shaped, and capable of laying up to 500 eggs. The eggs are ellipsoidal bodies, sometimes symmetrical, but more often slightly curved and somewhat kidney-shaped. They are usually twice as long as they are broad. How long is required for the embryonic development is not yet determined, but it is apparently not over two or three days in warmer weather and much longer in cool.

The eggs are laid at the rate of ten to fifteen per day, and are surrounded by a gelatinous substance, which acts as a protection. The larva emerges from the egg through a hole which it pierces in the shell. It is a slender, cylindrical animal, blunt at the antennæ, and tapering at the posterior end to a pointed tail. The structure of the larva is simple; it is essentially a tube (the alimentary canal) within a tube (the body wall), the space between (the body cavity) being filled with a liquid and with minor structures. The alimentary canal consists first of a buccal spear, pointed at the anterior end and with three small knobs at the posterior extremity, and pierced its whole length by a fine canal. Connected with the basal knobs are retractile and exsertile muscles. The spear is used by the nematode in boring its way out of the egg and through the plant tissues, and through it the nourishment is apparently drawn, for its canal is continuous with the lumen of the remainder of the alimentary canal.

The larvæ of *Heterodera radicicola* are not very resistant to unfavourable conditions. If allowed to remain in water long they soon die and decay, although damp or wet soil, provided the air supply is good, is favourable to their existence. Drying out of the soil is fatal to them in a comparatively

short time. They are able, however, to remain alive in the soil for months without entering upon a parasitic existence. They are not supposed to be able to take any nourishment from the soil, and do not undergo any development until they enter the roots of some plant. It is stated that if an infected soil be kept free of vegetation for two years they all die, and even one year without food is supposed to be sufficient to kill large numbers of them.

In the normal course of development, the larvæ, having encountered a root, seek its growing point and batter their way into it by the aid of the buccal spear. They then take up a position entirely within the root, and parallel to its longitudinal axis, the anterior end pointing away from the tip of the root. In the case of larvæ which hatch from eggs produced within the root, some bore their way out into the surrounding soil and enter new roots, while others burrow along in the tissues of the root and settle down. Within the tissues the larva becomes fixed in position and remains quiet, except for occasional movements of the spear and esophageal bulb. All the nourishment appears to be taken through the hollow spear.



Life History of the Eelworm.

Top left hand Young male worm, and below it young female; below again egg, and at bottom half-grown female worm.

On the right: Mature male worm ready to emerge from old body covering; below, mature female worm.

In the earlier stages of life the sexes cannot be determined, and both are somewhat spindle-shaped; but by the fifteenth to twentieth day the difference becomes apparent. The change in the female is most marked in the shape of the posterior end of the body, which no longer possesses the tail it had. Apparently fertilisation must take place about this time, and as the female matures she rapidly increases in thickness. The male is more thread-like in appearance, and is said to perish after having performed its function of fertilisation.

How the Pest is Spread.

The larva of the nematode is capable of active movement in the soil, and in this manner the disease is slowly spread under favourable conditions. However, it is not through their own efforts that the nematodes are mainly spread. There are many means at their disposal; running water is one, and hence it is that in a vineyard situated along a creek that is subject to flooding, one may find patches of vines affected with root knot, soil from an infested field higher up having been carried down.

Other means of transportation are the hoofs of animals, wheels of vehicles, vineyard implements, men's boots, &c. Thus a vineyard implement going from one vineyard to another, if the soil is at all damp, will carry with it some of the damp earth, probably containing nematode larvæ. Nursery stock is another means of dissemination of the pest, and to my mind, the

chief one. Many nurserymen grow sundry varieties of plants at different times upon the same piece of land, and in fact one often sees vine cuttings struck amongst rows of vegetables and other such plants. If the nursery soil is affected, and the plants growing thereon are susceptible to eelworms, the soils will become badly infested in time, as most land chosen for nursery purposes is favourable to nematode development. The practice of striking vine cuttings in vegetable patches cannot be recommended, and young vines, before being planted out into the vineyard, should be closely examined for any signs of root knot.

It is stated by some authorities that nematode galls are not found on roots of plants beyond a certain depth. Frank says he has not found them below 13 inches; other writers say 3 feet, but most agree that the majority of galls are to be found in the first foot of soil, and that if vines and trees can be forced to root extensively at a depth of at least sixteen inches, they suffer but little from root knot. I have always found that in cases of infection, the roots of the vine situated near the surface are more extensively covered with galls than those deeper in the soil. It appears feasible, then, that wherever possible we should endeavour to establish the root system of the vine at a depth of sixteen inches or more below the surface of the soil.

Conditions Favouring Root Knot.

As mentioned previously, root knot is essentially a disease of light soils, and where a soil is sandy and other conditions are favourable, the nematodes may be expected to thrive when once introduced. In heavy soils the disease is not to be feared. I have not yet seen an affected vine growing in a clay soil, and if infection was possible, these types of soil could readily be dried out by being ploughed and left in the rough.

A certain degree of moisture is necessary for the maintenance of the life of the nematode. This does not mean that the soil must be wet, but it must have sufficient moisture in it to be properly called moist, though not enough to fill air spaces and interfere with proper aeration. On the other hand, soils that are waterlogged for a considerable part of each year are usually free from the trouble.

The effect of temperature on the nematode larvæ is important. The higher the temperature, providing the soil is not too dry, the more actively the nematodes develop, but where the soil temperature falls below 50 deg. Fah., they become practically inactive, but they are capable of remaining alive when exposed to great cold.

Controls.

Precautionary measures to prevent infection are the safest. A grower would be wise to pay particular attention to all vines coming from the nursery and to inspect them individually before they are planted in the vineyard. Nurseries which are known to be infested with the trouble

should be avoided. As much as possible, inter-planting manure or vegetable crops which are known to be susceptible to root knot, should be avoided.

If any patches of vines affected with root knot should appear in a vineyard, one could try deep applications of fertilisers to induce the root systems of the vines to extend deeply. Nitrogenous manures may prove an advantage.

The land should be kept free from weed growth as much as possible, as many weeds are susceptible and are likely to harbour the trouble, as well as proving suitable plant food for the larvæ. On areas that are infested a system of fallowing should have a decided influence in reducing the trouble, and in fact, should eradicate the pest. In preventing plant growth, one sets up a system of starvation for the nematodes.

Flooding does a certain amount of good, but it means leaving the water on the land for a long period, and this is likely not only to affect the plant, but also, with certain soils, to cause chemical troubles, such as the deposit of injurious alkaline matters near the surface after the surplus moisture has been evaporated off. When the nematodes are enclosed within the root galls, flooding would need to be carried on for a long period. Twenty-five days successive flooding is supposed to exterminate the larvæ. The soils which would carry the water well for a long period, however, are those that are not likely to be troubled with root knot to any extent, and, on the other hand, soils likely to be affected most with the pest are those, which, as a rule, are of a very porous nature, and with these soils flooding for any length of time is out of the question.

The drying out of a soil is looked upon as fatal to both eggs and larvæ of the eelworm. G. P. Lounsbury, Entomologist of the Department of Agriculture, Cape of Good Hope, stated that the nematode occurs in soils well supplied with moisture, and that grape vines badly knotted when set out in rather dry soil, not only recovered, at least in part, but did not spread the nematodes to surrounding susceptible plants. Several other authorities point out that dry soils are unfavourable to the development of root knot. It is probable, therefore, that if an affected vineyard was deeply ploughed and left in the rough to permit it to dry out sufficiently, the pest would be greatly reduced. The practice, of course, would only be possible where the climate was dry in certain periods of the year. In our irrigated districts, where the climate is particularly hot and dry during the summer months, the practice could be tried, irrigation being delayed for so long as would be safe, and the soil being turned up and left in the rough state. Where soils receive water by seepage, or where rain is experienced, no improvement could be expected.

Various forms of chemicals have been suggested, and may have been tried out in small areas, carbon bisulphide, formaldehyde, calcium carbide, potassium and sulpho-carbonate being among them. The object aimed at with most of these chemicals is for the gases to penetrate the soil and to

destroy the larvæ in this manner. I am unable to anticipate that any such treatment will be of practical value, and as far as treating a vineyard is concerned, the method would be costly and not effective. Such experiments failed badly in connection with phylloxera. Quicklime has been tried, but is of no value, even with such heavy dressings as five tons per acre.

Of all the chemical mixtures, those of a fertilising nature only are likely to be of use, and with these one does not expect direct action in the way of the destruction of the larvæ but the encouragement of deeper root growth, with consequent beneficial effect upon the growth and future health of the vine.

It is intended, in the near future, to carry out some pot tests with different varieties of phylloxera-resistant rootlings planted in badly infested eelworm soil, in order to gather some definite data as to whether any stock or stocks are immune from attack.

A Bulletin for Dairy Farmers.

The series of articles on the general outlay and construction of dairy farm buildings, by Messrs. L. T. MacInnes (Dairy Expert) and A. Brooks (Works Superintendent), will be recalled by every regular reader of this journal. The matter has now been assembled in the form of a separate publication (Farmers' Bulletin, No. 149), copies of which are available at 7d. each, post free.

"Dairy Farming Projects."

This book has been prepared, says the author, for two kinds of dairymen. "Primarily, it is for vocational agriculture dairy farming pupils. but it could not be a good book for such pupils without being adapted also to the needs of men engaged in dairy farming who are out of school and who desire to improve their livestock and equipment, their methods and profits."

The writer is C. E Ladd, Ph.D., Professor of Agricultural Economics and Farm Management, Cornell University, and the claim that in producing a text-book for the student he has produced also a handbook of considerable value to the farmer must be admitted. The method of presentation is essentially "educational." The chapters are arranged, for instance, by months during the school year to promote seasonal study of dairy farming activities, but the plan is no detriment from the point of view of the general reader, to whom a wealth of useful information is made accessible, to say nothing of that to which the reference system gives him recourse.

That this little publication looks at dairying from the American angle may discount its value a little for the Australian reader, but it is nevertheless well worth notice. Well illustrated and indexed, it comprises one of the Macmillan Agricultural Project Series. Our copy from the Macmillan Company, London.

Spray Gun *versus* Nozzle.

Their Comparative Efficacy against Woolly Aphis.

W. M. WALKER, Orchardist, Glen Innes Experiment Farm

Spray gun and double nozzle trials at Glen Innes Experiment Farm orchard were the subject of a report in the *Gazette* of May, 1923. The report gave the relative quantities of spray used and the times taken. During the past season further trials have been carried out under comparable conditions to ascertain what effect the continual use of the gun has on woolly aphis as compared with the continual use of nozzles. The trees upon which the tests were made were the same as those described in the previous report.

A combined spray of arsenate of lead and tobacco wash was applied at the regulation periods—(1) to two rows (62 trees) through double nozzles, and (2) to one row (31 trees) with the gun. The trees (Dunn's apple) were much of an even size. The quantity of spray used at the first application on the two rows (through double nozzles) was 220 gallons, and the time required by two operators was 1 hour 25 minutes, or at the rate of 110 gallons and 42½ minutes per row. The quantity used on the single row (through the gun) was 125 gallons, and the time required by one operator was 1 hour 10 minutes.

It will be noted that 15 gallons of additional spray material was required on the row where the gun was used, whereas the time required was 15 minutes less. There was a slight variation in the quantity of spray and in the time required at the second and third applications. These three sprayings with lead arsenate combined with tobacco wash were applied essentially as a codlin moth spray, both with gun and nozzles, no special attention being given to the woolly aphis.

An application of tobacco wash was given (the single nozzle being used instead of the double) after the last spraying of arsenate of lead, or just before the harvesting season. After each application it was observed that the growth of woolly aphis was much more rapid on those trees sprayed through nozzles, and the difference was very apparent during harvesting season, when time did not permit the full attention to spraying.

At the general washing of the trees in the autumn a note was again made of the material used and the time required in the application of tobacco wash spray. On the two rows 640 gallons of spray and six hours of two operators' time was required. On the one row 240 gallons and two hours of one operator's time was required. It will be observed that it was necessary to use 80 gallons more material per row and an hour's extra time to clean to an equal degree those trees that had been sprayed during the season by means of the nozzles. The fact that it took a considerably greater quantity of spray to rid of aphis the trees that had been continually sprayed with the nozzles than those that had been continually sprayed with the gun (the former being

far worse infected) shows the gun to be more efficient than the nozzles when spraying for aphis, but some doubt can be expressed as to whether it is satisfactory for the application of lead arsenate sprays for codlin moth, especially at the calyx stage. Further experiments will be necessary before a definite opinion can be given. There was not sufficient moth infestation at this orchard to give a result on this point.

In the previous report on experiments with the spray gun, the operator expressed the opinion that 8-foot rods were more convenient to use than the gun, but that the gun was more convenient than 10-foot rods. After a season's use, however, the same operator states that the gun is much more convenient and easier to manipulate than any length of rod.

Stallion Clubs in Canada.

The policy of making grants to clubs that hire approved stallions, says a recent report of the Canadian Minister of Agriculture, was started in 1915, the scheme (which is based on the "Scottish premium system") providing that any district which forms a club for the purpose of hiring an approved pure-bred stallion, and which complies with the regulations, is paid a grant equal to one-third of the amount paid by the club members as fees to the stallion owner. By this means the owners of mares and the proprietors of good stallions are both benefited. The former are enabled to secure the services of a first-class horse at a very nominal fee, while the latter are assured by contract of a certain definite return from the service season. Thus the keeping of good stallions is made possible, while community breeding and better feeding, care and management are encouraged among the mare owners.

The organisation of communities for the purpose of hiring a stallion has in many cases only been one phase of the work. Colt shows have been established, which have done much to create an interest in better breeding and at the same time have been the cause of leading the breeders to study all phases of the question in an endeavour to produce winners. Community horse sales have also been carried on in certain districts, and a healthy rivalry has sprung up in sections as to which club will secure the services of the best stallion.

Clubs are required to stick to one breed, and thus grade up a definite type in the community. All stallions for club use are inspected by experienced horsemen and judges, only sound, individually excellent animals that possess the size and characteristics of the breed required being allowed to stand for service.

Pursuant to representations by the last conference of Ministers of Agriculture, the Federal authorities have issued a proclamation prohibiting the importation of bran bags of less net weight than 20 oz. each, as from 1st July, 1924. Importations that do not comply with the proclamation may be admitted, provided proof is produced that the goods are under contracts actually entered into prior to the date mentioned.

Control of "Black Spot" of Apple.

A Record of the Department's Experiments with Sprays.

H. A. MILLS, Fruit Inspector, and W. LE GAY BRERETON, Assistant Fruit Expert.

BORDEAUX mixture has for many years and in many countries been the recognised fungicide for control of "black spot" of the apple and pear. Unfortunately, it cannot be employed at certain stages of development of apples and pears without risk of more or less damage to the surface of the skin. The damage is certainly more severe on some varieties than others, but the severity of the damage on any variety cannot be foretold, as it apparently varies with the rapidity with which copper sulphate is yielded from the Bordeaux mixture. This in turn is controlled by the atmospheric conditions following the application of the spray.

For this reason experiments were commenced at the departmental orchards in 1913, with the object of ascertaining at what strength lime sulphur could be applied to fruit trees at various stages after growth had started in the spring, laboratory tests in the manufacture of lime-sulphur also being carried out by the Department's chemist. Formerly lime-sulphur had only been used as a spray for deciduous fruit trees during the dormant period. After a few seasons reliable information was gained on the point, and duly incorporated in the Department's publications relating to the use of lime-sulphur.

The districts in which our chief apple and pear experiment orchards are situated are practically free from apple and pear black spot, only two outbreaks of this disease having occurred at Bathurst, and none at Glen Innes since the planting of these orchards. This, while satisfactory from the point of view of those in charge, prevented any data being collected on the efficiency of lime-sulphur or other sprays as controls. After ascertaining the strengths at which lime-sulphur could be used on apple and pear trees, it was therefore necessary to continue experiments in districts where black spot of apple and pear was prevalent.

To do so necessitated conducting the experiments in private orchards. For the facilities afforded our warm appreciation must be expressed, as such experiments cannot be carried out without upsetting to some extent the routine of the orchard. There are, however, certain drawbacks to carrying out such work in other than departmental orchards, the more serious being the uncertainty of continuity from season to season, and the inability of the officer in charge to observe daily, if necessary, any developments that occur. This is exemplified in the very abbreviated account of the "outside" experiments in black spot of apple given below. Comparison of the data

RESULTS of Spraying Experiments at Penrose, 1922-23.

Variety.	A. Sprayed (1) 7 to 10 days before spur-burst with Bordeaux mixture, 6-4-22; (2) at spur-burst with Bordeaux mixture, 6-4-40; (3) at setting of fruit with Bordeaux mixture, 6-4-50.			B. Sprayed (1) 7 to 10 days before spur-burst with Bordeaux mixture, 6-4-22; (2) at spur-burst with lime-sulphur at spur-burst strength; (3) at setting of fruit with lime-sulphur at summer strength.			C. Sprayed (1) at spur-burst with Bordeaux mixture, 6-4-40; (2) at setting of fruit with Bordeaux mixture, 6-4-50.			D. Sprayed (1) at spur-burst with lime-sulphur at spur-burst strength; (2) as setting of fruit with lime-sulphur at summer strength.			E. Sprayed with atomic sulphur, 10 lb. to 84 gallons water, (1) at spur-burst; (2) at pinking stage; (3) at setting of fruit.			F. Control trees, not sprayed with fungicide.		
	Clean Fruit.	Spotted Fruit.	Percentage Spotted Fruit.	Clean Fruit.	Spotted Fruit.	Percentage Spotted Fruit	Clean Fruit.	Spotted Fruit.	Percentage Spotted Fruit.	Clean Fruit.	Spotted Fruit.	Percentage Spotted Fruit.	Clean Fruit.	Spotted Fruit	Percentage Spotted Fruit.	Clean Fruit.	Spotted Fruit.	Percentage Spotted fruit.
Delicious	715	269	27.3	487	332	40.5	321	289	47.4	309	30	8.8	236	247	51.1	175	449	71.9
London Pippin .	544	23	4.1	544	23	4.1	518	65	11.1	667	38	5.4	840	320	27.6	519	400	43.5
Dunn's	924	324	25.9	122	347	73.9	270	318	54.1	190	42	18.1	181	262	59.1	173	522	75.1
Granny Smith ...	345	4	1.1	557	30	5.1	506	53	11.5	189	4	2.1	253	25	9	144	179	55.4
Totals	2,528	620	19.7	1,710	732	30	1,515	725	32.4	1,355	114	7.8	1,510	854	36.1	1,011	1,550	60.5

NOTE.—"At setting of fruit," would be approximately the same period as the calyx application of lead arsenate.

which has been gained from experiments in the control of apple mildew at Bathurst and (more particularly) Glen Innes Experiment Farm orchards with the still very incomplete and often conflicting results from experiments in black spot control where we have been obliged to utilise other than departmental orchards gives some indication of the progress made under the two conditions. The results obtained from experiments in the control of black spot of the Williams pear are an exception. These experiments were carried out on a private orchard at Turramurra, and definite results were obtained (see *Gazette*, February, 1922). Black spot of pear is very closely allied to black spot of apple, and the report of those experiments should be read in conjunction with this report.

The first outside experiments in the control of black spot of apple were carried out in an orchard in Penrose district in the season 1913–14. The plots comprised Yates' varieties only. No results were obtained, as the crop was very light and practically free from spot.

In 1914–15, on the same plots, both Bordeaux and Burgundy mixtures showed a better control of black spot than lime-sulphur ; but both Burgundy and Bordeaux mixtures russetted the fruit badly, the Burgundy being the worse in this respect. The percentages of clean and spotted fruit at harvesting from the various plots were as follows :—

Spray used.	Percentage Clean Fruit.	Percentage Spotted Fruit.
Burgundy mixture	94·75	5·25
Bordeaux mixture	88·54	11·46
Lime-sulphur	66·00	34·00
No fungicide	16·23	83·77

In 1915–16 the experiment was carried out on the same trees, but on account of the russetting caused by Burgundy and Bordeaux mixtures the test was, at the owner's request, confined to lime-sulphur. The number of applications were varied, viz. :—One application only : at pinking stage. Two applications : at pinking stage and at calyx stage. Three applications : at pinking stage, at calyx stage, and one month later. Four applications : at pinking stage, at calyx stage, one month later, and again four to five weeks later than the lastnamed. Control plots which received no fungicide were of course included. Owing to there being only a very slight outbreak of black spot this season, no results were obtained.

In 1916-17 season the experiment was repeated exactly as in 1915–16, with the following results :—

Spray used.	Percentage Clean Fruit.	Percentage Spotted Fruit.
Lime-sulphur, one application	36·7	63·3
,, two applications	59·9	40·1
,, three ,, ...	90·1	9·9
,, four ,, ...	90·6	9·4
No fungicide	2	98

Arsenate of lead was combined with the lime-sulphur in the calyx and later applications, and it was noted both in this and the previous season that the trees sprayed with this combination showed less moth than those sprayed with arsenate of lead alone. It was intended to repeat this experiment on

the same trees in 1917–18 season, but just prior to making a start the owner of the orchard informed the Department that he could not allow unsprayed control trees. As the experiment would have been valueless without controls, it had to be discontinued in this orchard, and the season was too far advanced to make arrangements for another. This was unfortunate, as black spot was particularly bad that season, even worse than in 1916–17, and a test would have been most valuable. The orchard was kept under observation and a good control was kept over black spot with lime sulphur, though it was bad in orchards that had received no fungicide spray.

In 1918–19 the experiment was re-opened on another orchard in the Penrose district, using both lime-sulphur and Bordeaux mixture. Both fungicides showed control, but the season was not favourable for spot, and the outbreak was only very slight on the unsprayed control trees. Bordeaux russetted the fruit badly.

In 1919–20 the experiment had to be abandoned again, shortage of labour causing the owner to be behindhand in his work. He subsequently left the locality, and failure to obtain the use of suitable trees in the Penrose district in 1920–21 resulted in the experiment being started in the Towrang district. Bordeaux mixture, lime-sulphur, and atomic sulphur were used, but there was no result as there was no outbreak of spot. The experiment was continued at Towrang in 1921–22, but again there was no outbreak of spot. Bordeaux mixture russetted the fruit.

As Towrang district is less liable to black spot than Penrose, the experiment was shifted back to the last-mentioned district in the 1922–23 season, when suitable trees were offered. The experiment was divided into five variously-sprayed plots and one unsprayed or control plot, marked A to F in the accompanying table, which shows the spray used, the periods of application, and the counts of clean and spotted fruit at time of harvesting of each plot. Each plot contained two trees each of the varieties Delicious, London Pippin, Dunn's, and Granny Smith.

All the sprayed plots, even the atomic sulphur plots E, showed a lower percentage of spotted fruit at picking time than the unsprayed control plot F, not only in the totals for all varieties but for each variety.

Plot D (lime-sulphur) shows the lowest percentage, taking the total for all varieties, and shows practically only 1 per cent. more spot than A (the next lowest in totals) in London Pippin and Granny Smith, and practically 18 per cent. and 8 per cent. less spot in Delicious and Dunn's respectively. The superior showing of lime-sulphur reverses the results of 1914–15 season, but such a reversal is quite common in field experiments, and it is for this reason that experiments must be conducted over several seasons before conclusion can be reliably drawn. But further analysis of this table raises the question as to whether a count at picking time is to be relied on as an indication of the control of the diseases affected by the spray. Take plot B for instance. This received exactly similar applications of lime-sulphur to plot D, and

in addition had an earlier application of Bordeaux mixture, yet it occupies only third place by count. The early application of Bordeaux might have been of no value, but it could hardly have caused a higher percentage of spot

It is true that if Bordeaux mixture and lime-sulphur are mixed a chemical reaction takes place, and quite possibly the result is a lower fungicide power than either Bordeaux or lime-sulphur, and it is also probable that when lime-sulphur is applied seven to ten days later than Bordeaux there would still be a residue of Bordeaux adhering that would cause a reaction with the later applied lime-sulphur. But the residue Bordeaux would be on the old tissue that was exposed when the tree was dormant or almost so, and portion of the lime-sulphur applied at spur-burst would cover newly exposed growth and would not be affected by the Bordeaux previously applied.

Then again, treatment A shows a superiority to C by count, which is an indication that the application seven to ten days before spur-burst is helpful in the control of black spot.

In the experiments on black spot of Williams pear at Turramurra this early application did not prove of value. Whether this early application would be useful or not would depend on the season, as at the wintering stage the fungus requires heat and moisture to start it into activity. The same remarks apply to the question whether the application should be made at spur-burst or a little later at the pinking stage, or still later when old blossoms are opening, but as seasons vary so would there be exceptions to the average results arrived at. One season during the Turramurra experiments black spot did not develop until after the petals had completely fallen, and that season the first application could have been delayed till the calyx period.

The following notes on the russetting effect of Bordeaux mixture were taken during the experiment.

Bordeaux mixture has only a very slight russetting effect—not sufficient to affect the sale of the fruit—on Delicious, London Pippin, and Granny Smith. But on Dunn's it had a very bad effect, practically spoiling the fruit for sale and often causing it to crack.

Dunn's apple is very generally found to be susceptible to Bordeaux injury, but it would not be safe to assume the immunity of the other varieties to damage from the results of this experiment, as in experiments carried out some years ago at Glen Innes Experiment Farm orchard London Pippin suffered very severely from the effects of Bordeaux. This injury was caused by one application only at the pinking stage. The experiments consisted of ten plots of eight trees each, with ten control plots of four trees each, which puts it beyond any chance of coincidence. We have also noted severe russetting of Granny Smith from Bordeaux mixture. The extent of the injury from Bordeaux mixture cannot be foretold, as apparently it depends on the rapidity with which copper sulphate is yielded from the mixture, which in turn depends on the atmospheric conditions following the application.

Departmental experiments have shown that apples are less susceptible to Bordeaux spray injury four to five weeks after the falling of the petals, and

still less nine to ten weeks after the falling of the petals. Even when the injury from Bordeaux mixture is only slight, they lack that bright clear-skinned appearance of fruit that has received either no fungicide or only lime-sulphur. Apples that are only slightly russetted by Bordeaux will take on a sleepy condition more quickly than those showing no spray injury.

Bordeaux mixture is a valuable fungicide, and for this reason experiments are being conducted at Glen Innes Experiment Farm orchard to endeavour to find a copper-sulphate and lime combination that will be less liable to cause injury.

HICKORY KING MAIZE CONTEST.

ENTRIES are invited from farmers who grow Hickory King maize for a "yield contest" on similar lines to those of the contests that attracted so much attention among maize-growers during the last two seasons. The conditions will be as follows:—

1. The contest is designed to be a test for the best yielding strain of Hickory King seed maize in the State.
2. Each competitor should send ten (10) pounds of his competing seed to the Under-Secretary, Department of Agriculture, Sydney, before 31st August, 1924. Competitors should be careful, when forwarding seed for entry, to mark the parcel on the outside, "For Hickory King Contest," and also to place a note inside the package with the seed showing their name and address. They should write to the Department immediately the seed is forwarded.
3. Three farms will be selected on the coast with as uniform land as possible (one each on North, Central, and South Coast), on each of which a plot of the competitor's maize will be sown under identical conditions; the field will be given the same cultivation treatment throughout.
4. The Department reserves the right to exclude any entry which does not conform to the standard type and purity of seed.
5. After harvesting and weighing the maize, the produce will remain the property of the farmer on whose land the test was conducted.
6. Fertiliser may be used at the option of the farmer on whose land the test is made, in which case the amount used will be the same on each plot.
7. When the crop is ready to harvest, an equal area of each plot will be pulled, husked, shelled, and weighed, and the best yielding strain of seed will be determined by that seed showing the best average yield on the three farms on which the test is conducted.

Messrs. Clifford Love & Co., Ltd., Sydney, manufacturers of cornflour (for which foodstuff Hickory King maize is most suitable), have donated £10 10s. to be used as prizes in the contest. Out of the money £2 2s. will be awarded for the winning seed on each of the three farms, and the balance will be divided into a first prize of £3 3s., and a second prize of £1 1s. for the seed yielding the best average on the three farms.

Poultry Notes.

AUGUST.

JAMES HADLINGTON, Poultry Expert.

IT is not, I think, unduly optimistic to say that the rearing season of 1924 has opened under more promising conditions than have obtained for a decade. With regard to the cost of feeding, the present outlook is that it will be very little in excess of that of pre-war times, while the portents are for very much better prices for eggs than prevailed last year.

It was inevitable that the low prices ruling for eggs during the flush season (August to December) of last year would be followed by higher rates this year, for the simple reason that they were below the cost of production, or at any rate so low that the remuneration to the farmer was altogether inadequate. The result was that less chickens were hatched, and quite a number of the timid or weak farmers dropped out of the industry, and only a comparatively small number of new ones entered into the business. The position in 1924, therefore, is that less eggs are being produced. This is most unfortunate, because of the small quantity that will be available for export to follow up the reputation our eggs have already made in Britain.

There is, therefore, every inducement this year for the poultry-farmer to increase his flock. All this confirms what has from time to time been put forward in these notes, that is, that poultry-farming, like every other business, is subject to fluctuations in the matter of returns, but that the person who has the adaptability for the work and the "grit" to stick to the industry must (and does) come out right in the end.

The levelling-up process is sharp and decisive. High cost of feeding and low prices for eggs at the same time cannot last for many months together, because of two factors that come into play at once. These are, the selling off of productive stock as table poultry, and the reduction in the number of chickens hatched. Poultry-farming is thus one of the most elastic businesses one can be engaged in, but this very feature calls for some business ability if a poultry-farm is to be run successfully.

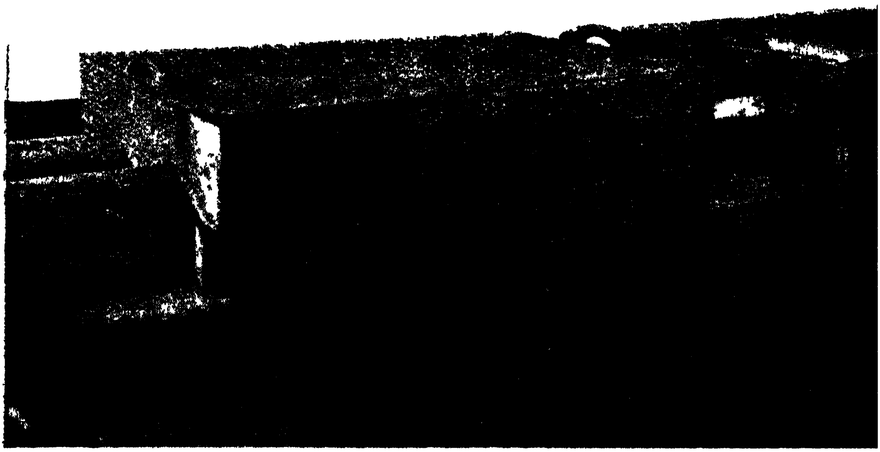
The improved outlook is already having some effect, and it will be more apparent as the rearing season advances.

Brooding Chickens.

It has been pointed out that almost anyone with an ordinary mechanical "sense" can hatch chickens from good eggs with a reasonably good incubator, but skill and good equipment are necessary for successful rearing. In the matter of rearing equipment there is a lamentable confusion of

ideas. It has been the aim of the writer to bring about, as far as practicable, the standardisation of brooding equipment, it being realised that uniformity of practice would have the best possible effect on the industry from an educational point of view

Moreover, multiplicity of brooding arrangements, and the variations and improvisations made thereon, lead to much confusion in practice and enormous losses in chickens. Some improvement is, however, in evidence, insomuch as hot water circulation has become the most popular system on commercial farms Here again one sees many departures from the plans supplied by the Department The result is some failures, and in any case less efficiency than would be obtained from the same expenditure if the plans had been rigidly adhered to



The Hover complete.

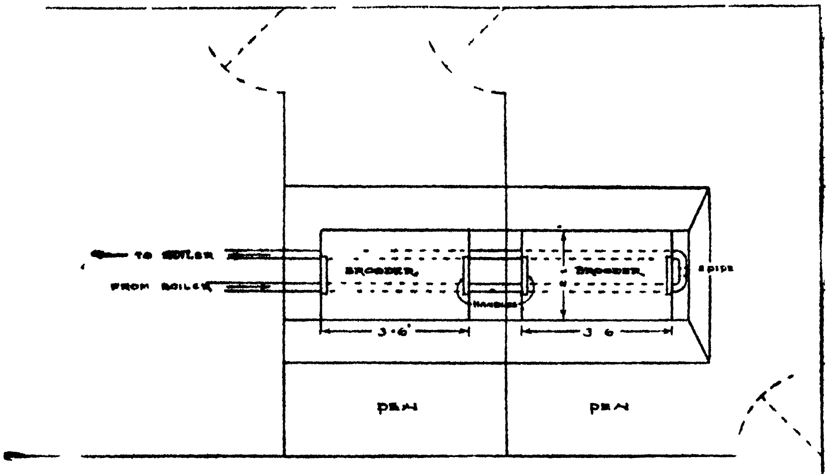
However, the chief bone of contention now is not the efficiency of hot water circulation, but boxes *versus* hovers over the pipes. Of the latter there are in operation quite a bewilderment of ideas, from good to very bad, and many thousands of chickens are sacrificed in consequence.

Hovers.

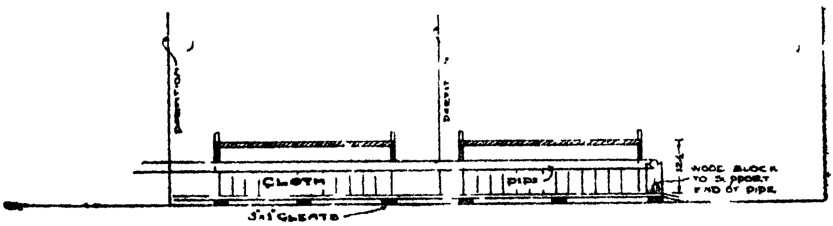
Since the narrowing down process has now gone so far as to resolve itself into two main ideas, and as many favour the hover system on the pipes, I have devised a simple and effective hover, which any handy man could make at trifling cost with the help of the accompanying illustration and plan Indeed, nothing could be simpler than the construction that has been devised. The hover illustrated has been planned for 100 chickens, and is one of a number placed along the pipes as shown in the illustration, but separated from one another by wire-netting.

The timber used is dressed oregon, three-quarters of an inch in thickness. Redwood or colonial pine can be used, but they are more expensive . The

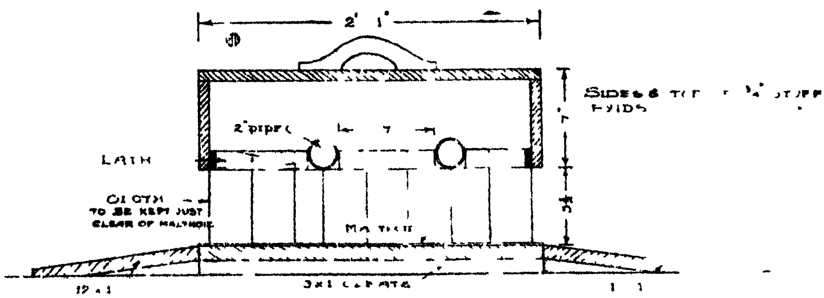
size is 42 inches by 25 inches, with a rim round 6½ inches deep, out of which is scolloped the half-rounded slots at each end to fit over the pipes. The height from floor to rim is 4 inches. A strip of grey flannel or kersey 6



Plan of Hover Heated by means of hot water circulating system.



Longitudinal Section.



Cross Section.

inches wide is tacked on to the inside of the rim and slit at 2-inch intervals all round to enable the chickens to get access to the heated zone under the hover. Immediately under the hover, and projecting some inches from it, is

the floor, made of 1-inch boards. This floor should be nailed together on 3 by 1 inch battens to admit of air under the floor. This will raise the deck of the floor to 2 inches off the floor of the brooder-house, and the rise is negotiated by means of a bevelled ramp board, so that there shall not be a ledge in front of the brooder. Any ledge would prevent the chickens from moving back into the heated zone during the night should they have been forced out by too much warmth. This applies to all brooders. In operating these hovers the chickens should be kept within 12 inches of the hover by means of moveable boards for the first three or four days after they are put in.

These hovers, which have been installed for demonstration purposes at the Government Poultry Farm, Seven Hills, as mentioned in last month's notes, are working satisfactorily together with the usual box pattern of brooder, with which four brooder houses are fitted.

Treatment of Bokhara Clover Seed.

The failure in many cases to obtain a satisfactory stand of any of the strains of Bokhara clover points to the advisability of treating the seed before it is planted, with the object of increasing its germinating capabilities. The reason for the seed not germinating readily, even in soil provided with optimum conditions of moisture and temperature, is that a large percentage of the seed is "hard"—a term that usually denotes that the seed coats are somewhat impervious to moisture. In America scarifying machines are used to treat clover seed in order to scratch the seed coats, the seed being blown over a rough surface (generally sandpaper). Considerably improved germination is the result.

As Bokhara clover is only grown in small areas in this State, and principally by apiarists, only small quantities of seed are sown by individual growers. An effective method of improving the germination of the seed is to rub it between sheets of fine sandpaper, about No. 0 quality. Tack sandpaper to two pieces of board, each about 6 inches by 4 inches, and rub the seeds sufficiently to show fine scratches on their surfaces: 1 lb. of seed can be treated in this manner in about five minutes.

The following are the averages of a number of tests carried out with the various strains of Bokhara clover:

Results of Germination Tests.

	Seed not scratched.		Seed scratched.	
	In 5 days.	In 27 days.	In 5 days.	In 27 days.
	Per cent	Per cent.	Per cent.	Per cent.
Annual Bokhara (*Melilotus alba* var.) ...	10	12	74	84
Hubam Clover (*Melilotus alba* var.) ...	5	7	38	42
Biennial Bokhara (*Melilotus alba* var. ...	18	22	39	44

—J. N. Whittet, Agrostologist.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—

Boone County White ...	J. Chittick, Kangaroo Valley.
Craig Mitchell ...	K. W. D. Humphries, Muswellbrook.
Early Morn ...	H. S. King, Llangothlin.
Fitzroy ...	Manager, Experiment Farm, Grafton.
	A. M. Hooke, Taree.
	F. W. Hill, Yarramalong.
Funk's Yellow Dent ...	N. C. Pyemont, "Moondarra," Gundagai.
Golden Beauty ...	A. M. Hooke, Taree.
Golden Glow ...	W. A. McLeod, Ben Lomond.
Hickory King ...	J. Campbell, Wingham.
Large Red Hogan ...	G. E. Levick, Taree.
Leaming ...	Manager, Experiment Farm, Grafton.
Manning Silvermine ...	H. E. Smart, "Purfleet," Taree.
Pride of Hawkesbury ...	Dempsey Bros., Taree.
Sundown ...	J. S. Whan, Llangothlin.
Wellingrove ...	Manager, Experiment Farm, Glen Innes.

Millet:—

Hungarian ...	Manager, Experiment Farm, Yanco.
Japanese ...	Manager, Experiment Farm, Coonamble.

Sweet Sorghum:—

Collier ...	Manager, Experiment Farm, Grafton.
Early Amber Cane ...	Manager, Experiment Farm, Bathurst.
Honey ...	Director, Veterinary Research Station, Glenfield.
Orange ...	Manager, Experiment Farm, Yanco.
Red Amber ...	Manager, Experiment Farm, Glen Innes.
Saccaline ...	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Berry.
Selection, No. 34 ...	Manager, Experiment Farm, Yanco.
,, No. 61 ...	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Berry.

Grain Sorghum:—

Dwarf Kafir ...	P. A. R. Gersbach, Leeton.
Feterita ...	Manager, Experiment Farm, Coonamble.
Kafir ...	Principal, H. A. College, Richmond.
Manchu Kaoliang ...	Manager, Experiment Farm, Bathurst.

Dual-purpose Sorghum:—

Darso ...	Manager, Experiment Farm, Glen Innes.

***Sudan Grass* —**	
Sudan Grass	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Coonamble
	Manager, Experiment Farm, Temora
	Manager, Experiment Farm, Yanco
***Grass*:—**	
Elephant	Principal, H. A College, Richmond
	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Grafton
	Manager, Experiment Farm, Yanco.
Kikuyu	Principal H. A. College, Richmond.
	Manager, Experiment Farm, Lismore
	Manager, Experiment Farm, Grafton
	Manager, Experiment Farm, Yanco
	Manager, Experiment Farm, Cowra
Wimmera Rye	Manager, Experiment Farm, Temora
***Potatoes*:—**	
Coronation	J A Reynolds, Ben Lomond.
Early Manistee	G. W Kelly, Caves-road, Oberon
Early Rose	G. W. Kelly, Caves-road, Oberon
Factor	G W Kelly, Caves-road, Oberon
	K Bowen, "Newport," P.O Orange.
Langworthy	G. W Kelly, Caves-road, Oberon.
	K Bowen, "Newport," P.O , Orange
Late Manhattan	K. Bowen, "Newport," P O , Orange
Satisfaction	G W. Kelly, Caves-road, Oberon

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed

A PROFITABLE CO-OPERATIVE VENTURE.

AN interesting experiment in practical co-operation was described in an address at the recent State conference of the New South Wales Agricultural Bureau, when the saving to be effected by pool-buying of farm and household requirements was brought before the notice of delegates by Mr. F P McFarlane, the representative from Yarramalong.

It was in 1921 that it occurred to members of this branch of the Bureau that they might increase the purchasing power of their earnings by buying on a better market, an order for £26 worth of goods being made up by six members and one member being appointed buyer and distributor on a percentage basis. The first order proved such a success that the next one was increased to £40, with more buyers, and the third order to £300, with about forty buyers, since when the branch has turned over about £8,000 worth of such requisites as groceries, boots, fertilisers, seeds, and farm implements.

It soon became necessary to build a store and alter the method of distribution, a motor lorry being eventually used and a second member employed. Success had been achieved, it was stated (1) by allowing no credit, (2) by retailing the goods plus bare cost, and (3) by making the share or deposit only small, a member being required to find only £1, which he lent to the branch on call. The funds of the branch when the movement was started amounted to only about £28; the assets were now worth at least £250, a sum which had accumulated principally as an overrun on goods distributed. Bad debts amounted to less than £3. The saving effected had been more than 10 per cent., but estimating it at that figure £800 had been retained in the pockets of members, to say nothing of the effect of the activities of the branch on local prices.

Sugar Solutions for Fruit Preserving.

The Significance of "Percentage" in Relation to Strength

A. A. RAMSAY, Chemist.

WITH regard to the term percentage as applied to the composition of aqueous solutions of simple substances, a certain amount of confusion exists in the minds of many persons, the question often arising as to what exactly is meant by a specified percentage, say, of sugar as used in a syrup for the bottling of fruit.

The mistake made is to confuse the ratio of the weight of sugar to the weight of syrup, with that of the ratio of the weight of sugar to the weight of water. Take, for example, the case of 10 lb. of sugar dissolved in 10 gallons of water. Converting volume into weight, this would be at the rate of 10 lb. sugar to 100 lb. of water. The ratio of weight of sugar to that of water would therefore be 10 to 100. But the ratio to the *total weight of syrup* is different. Each 100 lb. of the syrup would contain 9·1 lb. sugar and 90·9 lb. water, so that the percentage of sugar present would be only 9·1 and not 10.

Photographic and similar formulæ afford other examples of the same kind. The solutions are invariably made up so that they contain a definite quantity of the active substances—by weight if solids, or by volume if liquids—in 100 parts by measure or volume of water; and what is commonly spoken of as a 10 per cent. solution of "hypo." is a solution which contains 10 parts by weight of hypo. in 100 parts by volume of water, or 1 oz. hypo. in 10 fluid ounces of water. If, however, one dissolves 1 oz. of hypo. in 10 fluid ounces of water the volume of the mixture is considerably more than 10 fluid ounces, because the solid, although still in solution, occupies space or volume on its own account, and although there are 10 parts of hypo. present to every 100 parts of water, the mixture does not contain 10 per cent. of its weight of hypo., and is therefore, strictly speaking, not a 10 per cent. solution.

In the case of solutions of simple salts or compounds in water, the percentage composition may be best stated as so many parts by weight of the substance per 100 parts by weight of the mixture. This method is followed in the tables found in scientific literature, and from this data the parts by weight of the substance in solution per 100 parts by weight of water can be readily calculated. A 10 per cent. solution would therefore be one containing 10 parts by weight of the substance and 90 parts by weight of water.

The appended tables have been compiled for the guidance of those concerned with the accurate preparation of the sugar and salt solutions used in the preservation of fruits and vegetables at such strengths as may be desired.

They indicate, it will be seen, the number of ounces required per imperial gallon of water for different percentage solutions, and show also the volumes of the resulting mixtures.

PERCENTAGE Solutions of Sugar.

Percentage of Sugar.	Sugar required for one Imperial Gallon of Water.		Volume of Resultant Mixture.			Degree Brix.	Specific Gravity.	Degree Baumé.
	lb.	oz.	gall.	pts.	fl. oz.			
5	0	8·44	1	0	5·15	5	1·01970	2·81
10	1	1·82	1	0	10·92	10	1·04014	5·58
15	1	12·30	1	0	17·36	15	1·06133	8·32
20	2	8·09	1	1	4·62	20	1·08329	11·14
25	3	5·45	1	1	12·87	25	1·10607	13·88
30	4	4·72	1	2	2·33	30	1·12967	16·58
35	5	6·34	1	2	13·28	35	1·15411	19·23
40	6	10·90	1	3	6·10	40	1·17943	31·94
45	9	3·20	1	4	1·29	45	1·20565	24·56
50	10	·30	1	4	19·58	50	1·23278	27·24
55	12	3·99	1	6	1·99	55	1·26086	29·89
60	15	·53	1	7	10·10	60	1·28989	32·44
65	18	9·80	2	1	6·35	65	1·31989	35·00
70	23	6·16	2	3	14·80	70	1·35088	37·50
75	30	1·06	2	7	2·80	75	1·38287	39·94

PERCENTAGE Solutions of Salt.

Percentage of Salt.	Salt required for one Imperial Gallon of Water.		Specific Gravity.	Degree Baumé.
	lb.	oz.		
1		1·62	1·00725	1
2		3·27	·01450	2
4		6·68	·02899	4
6		10·24	·04366	6
8		13·78	·05851	8
10	1	1·82	1·07335	10
12	1	5·87	1·08859	11·74
14	1	10·10	1·10384	13·6
16	1	14·54	1·11938	15·4
18	2	3·20	1·13523	17·24
20	2	8·09	1·15107	18·91

SILAGE AND THE QUALITY OF MILK.

THE opinion is held by some farmers that silage will taint the milk of cows to which it is fed. This opinion has not been confirmed by official feeding trials with silage at Wye (England). "On no occasion," says a report in the *Journal* of the Ministry of Agriculture, "has any bad flavour been noticed, and during the time the 1922-23 trial was being carried out the College herd was included in the Kent clean-milk competition, in which it was placed second. While the competition was in progress the milk was examined periodically by a dairy expert." It is added that the fat content was taken regularly during the trials, and that the records did not indicate that the change from roots to silage or vice versa had any definite effect upon the quality of the milk.

Orchard Notes.

August.

W. J. ALLEN and H. BROADFOOT.

PRUNING can be continued of most varieties of apples and pears and later starting varieties of stone fruits, especially in late districts, but a strong effort should be made to complete the operation in good time.

It is not too late to plant deciduous trees, although all planting of such trees would have been better completed before this, as earlier planting gives the tree a better chance to develop good root growth before the spring arrives. Citrus trees may be planted during August in warm, sheltered situations, and in places not subject to late frosts. If the locality is a cold one and the situation is exposed it is better to delay until danger from frost is over.

Winter ploughing should have been completed last month, and where this has not been done every effort should be made to complete it as expeditiously as possible. By this means the soil is brought into such a condition that it will absorb any rain that falls, while the organic matter is given a chance to decompose.

Manuring.

Up to the present time the application of artificial manures to many kinds of deciduous trees has not always given any apparent results; the application of farmyard manure, however, has been beneficial under practically all conditions. As stable manure is at times difficult to obtain, weak trees and refills should be given the first claim on such as is available. It cannot be too strongly stated that manure should not be applied near the butt of the tree. It should be spread out some distance from the butt and ploughed in.

Where citrus trees have not received their spring dressing of fertiliser, now is the time to apply it, except in the case of sulphate of ammonia and nitrate of soda, which leach out easily, and which should be applied late in September. Artificial fertilisers, too, must be kept away from the butt of the tree

Spraying of Deciduous Trees.

If the work is not already done, peach trees that have not yet begun to shoot may be sprayed with lime-sulphur or Bordeaux mixture for the prevention of leaf curl. Lime-sulphur (full winter stre gth) has proved very effective for San José scale when applied late, but it should not be applied later than the bud-swelling period. Miscible oil is also a reliable spray for killing San José scale, but it must be applied before the bud-swelling period.

If black peach aphis is showing on peach trees an application of oil will kill it; if oil is not being applied, tobacco wash can be added to lime-sulphur. It is generally necessary to follow up with other applications of tobacco wash for this pest.

Green aphis was prevalent on peach trees last year. An application of miscible red oil (winter strength) early in August will be found most beneficial. The oil should be applied before the buds begin to swell. Green aphis is much more difficult to control than black aphis after the tree has come into leaf, as the action of the green aphis tends to curl the leaf, which envelops the insect, and so protects it from the spray. Nicotine extract or tobacco wash can be used after the tree has come into leaf, and will kill the aphis where it makes contact.

This is the latest period at which oil should be applied for the various scale pests on deciduous trees. In many districts it is necessary to start this month on dormant swabbing for black spot. A leaflet with full directions for preparing and applying the above treatment can be had on application to the Department.

Grafting.

This operation is carried out when the sap begins to rise and the bark lifts freely. When trees have proved unprofitable they can be worked over to varieties that are doing well under similar conditions and are good from a commercial point of view. Apples should not be worked on pear stocks, nor pears on apple stocks. The procedure should be apples on apple stocks and pears on pear stocks.

In grafting it is necessary to use a knife with a keen edges, as a clean cut is of great importance. The scion should be firmly inserted in position and securely tied up, and then covered over with wax cloth or clay, or painted with wax. It is essential that the scion should be in good condition. It is always important, especially in grafting old trees with big limbs, that sufficient scions be inserted and so placed that the tissue is kept healthy, when the cut will soon callous over. When vines are to be grafted the soil should be removed from around the stock to a depth of 3 inches, and the scion having been firmly inserted, the whole should be covered up with earth as a protection until a union has been formed. If the soil cakes, it should be loosened with a light pronged hoe. After the scion has begun to grow, see that it has not thrown out independent roots, but is drawing sustenance from the parent stem.

Repairs.

Effective work and profitable expenditure of energy frequently depend upon adequate preparation. The prudent orchardist will therefore employ any slack time in overhauling his implements and vehicles, attending to fences and gates, setting his spray pumps in order and getting everything ship-shape for the busy months of spring and summer. Irritating delays are thus avoided and time usefully employed.

THE advantages of machine shearing have hitherto been limited to those whose flocks were large enough to justify power-driven plants, but hand operated outfits are one of the latest developments in favour of the small man

"The New Agriculture for High Schools."

Under a somewhat pretentious title, Dr. Kary Davis, of the George Peabody College for Teachers, U.S.A., has compiled a work of 500 pages on the "project" method of instruction—a method that seems to have secured a firm hold of American education.

The project plan, which was probably first of all adopted by teachers of agriculture, contemplates a well-planned undertaking which is to continue for a season or for some extended period, the size and climate of the locality, and the student's physical and mental abilities being considered in its selection. Projects can be arranged for individuals or for groups of students, and can be directed at the production of some agricultural product for profit, at some trial or experimental objective, at improvement of a property, or at the solution of management problems.

The business of farming and the principles of plant growth having been briefly stated, various "projects" are suggested in this work, one after the other, such as soil management, maize-growing, the production of small grains, and so on. The book presents twenty-five or more such projects, and the student finds himself led from crop to crop, and from animal to animal, with the object of instruction in the profitable management of each.

Apparently the American youth who essays the study of agriculture on the project method receives a good deal of help of a quite voluntary kind. It is not essential that the student should live on a farm, and if his parents are unable to supply equipment, bankers, merchants and other good-natured people "often freely advance funds for the purpose . . . For example in some cases eggs are furnished on condition that a certain number of pullets be returned in the fall." With such practical assistance, and with the aid of a comprehensive text-book such as that before us the student should learn a good deal and learn it in a practical way.

[Published by J. B. Lippincott Company, London, from whom comes our copy.]

The Drift-to-the-City Problem in U S.A.

As long as the unfavourable ratio between agriculture and urban occupations continues an abnormal movement from the farms is not only to be expected, but desired. It is one of the ways by which normal balance between agriculture and industry in time may be restored. From the national viewpoint however, this movement is to be deplored, both because of the conditions which seem to make it necessary and because it is draining from the country such a large percentage of the more intelligent and ambitious young farmers. Agriculture always produces a large surplus population, and under normal conditions feeds into the cities large numbers of the less intelligent, who, because of this, are not well adapted to modern farming, which requires intelligence of a high order, but are better off in the cities, which provide them with supervised work. It also sends many young men of superior intelligence who seek wider opportunities than exist in the country. In the past both classes have gone to the cities without detriment to either the urban centres or the open country, but conditions which have prevailed for the past three or four years have made drafts upon the best the country produces altogether heavier than is good for either the country or the nation.—Extract from the Report of the United States Secretary of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Trundle P. and A. Society	W. A. Tolmie	Aug. 14, 15
Parkes P. A. and H. Association	L. S. Seaborn	,, 19, 20
Illabo P. A. and I Society	J. M. Hamilton	,, 20
Gosford A. and H. Association (Citrus Show)	C. W. Ironmonger	,, 23
Forbes P. A. & H. Association	W. T. Gilchrist	,, 25, 26, 27
Gunnedah P. A. and H. Association	M. C. Tweedie	,, 26, 27, 28
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	,, 26, 27, 28
Grenfell P. A. & H. Association	Geo. Cousins	Sept. 2, 3
Cootamundra A. P. H. & I Association	W. W Brunton	,, 2, 3
Manildra P. and A. Society	J. Longley	,, 9, 10
Culcairn P. A. H. and I. Society	A. J. Ralph	,, 9, 10
Young P. and A. Association	T. A. Tester	,, 9, 10, 11
Northern A. Association (Singleton)	J. D. Guffils	,, 10, 11, 12
Ganmain A. & P. Association	A. R Lhuede	,, 16, 17
Cowra P. A. and H Association	E Todhunter	,, 16, 17
Temora P. A. H. & I. Association	A. D. Ness	,, 16, 17, 18
Junee P. A. and I. Society	T. C. Humphrys	,, 23, 24
Canowindra P. A. and H. Association	J. T. Rue	,, 23, 24
Murrumburrah P. A. and I. Association	W. Worner	,, 23, 24
Wellington P. A. and H. Society	A. E. Rotton	,, 23, 24
West Wyalong P. A. H. and I. Association	T. A. Smith	,, 23, 24, 25
Burrowa P. A. and H. Association	W. Burns	,, 25, 26
Barmedman A. and H. Society	T. P. Meagher	Oct. 1
Ardlethan A. Society	R. L. Neill	,, 1
Hay P. and A. Association	C. L. Lincolne	,, 1, 2
Corowa P. A. and H. Society	J. D. Fraser	,, 3, 4
Berrigan A. and H. Society	R. Wardrop	,, 7
Narandera P. & A. Association	W. H. Canton	,, 7, 8
Ariah Park A. Society	J. F. McInnes	,, 8
Carcoar H. C. and A. Association	T. J. Brady	,, 15
Deniliquin P. and A. Society	P. Fagan	,, 15
Griffith A. Society	M. E. Sellin	,, 15, 16
Gundagai P. and A. Society	C. S. Dale	,, 29, 30
Lismore A and I. Society	H. Pritchard	Nov. 18, 19, 20

1925.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 9, 10
Dapto A. and H. Society	E. G. Coghlan	,, 16, 17
Northern Suburbs A. & H. Association (St. Ives)	F. Conway	,, 16, 17
Kiama A. Society	G. A. Somerville	,, 24, 26
Wollongong A. H. and I. Association	W. J. Cochrane	,, 29, 30, 31
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	Feb. 13, 14
Guyra P. and A. Association	P. N. Stevenson	,, 17, 18, 19
Newcastle A. H. and I. Association	E. J. Dann	,, 24 to 28
Blacktown A. Society	J. McMurtrie	,, 27, 28
Manning River A. and H. Association (Taree)	R. Plummer	Mar. 4, 5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	,, 5, 6, 7
Mudgee A. P. H. and I. Association	R. Shaw	,, 10, 11, 12
Crookwell A. P. and H. Society	C. H. Levy	,, 19, 20
Cooma P. and A. Association	C. J. Walmsley	,, 25, 26
Royal Agricultural Society of N.S.W.	H. J. Raffety	April 6 to 15
Gloucester A. H. and P. Association	F. S. Chester	,, 22, 23

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Agricultural Gazette of New South Wales.

Root Development in Wheat.

R. D. LEES, B.Sc. (Agr.), Farrer Research Scholar, Wagga Experiment Farm.

The Effect of Superphosphate.

THE beneficial effect of superphosphate on the wheat crop over nearly the whole of the wheat belt of Australia is now so well established that the farmer recognises that he is courting failure if he puts in a wheat crop without using this fertiliser. During the seasons 1911 and 1912 Professor R. D. Watt, of Sydney University, carried out some observations which indicated that superphosphate, in addition to other useful effects, encouraged the rapid growth and deep penetration of the roots of the wheat plant, thus enabling it to draw its moisture supply from deeper layers of the subsoil than in the case of land receiving no fertiliser. Thus, when the average depth of root penetration was measured on unmanured and manured crops at various stages of their growth, it was found that the roots of the latter penetrated 8½ inches deeper than did those on the unmanured plots.

During 1923 the writer had an opportunity of carrying out further observations along the same lines throughout the growing season at Wagga Experiment Farm. Through the courtesy of the manager and experimentalist, access was afforded to a series of manurial experiment plots. There were ten plots in all; five early-sown plots of Zealand and five late-sown plots of Firbank. Each series was composed of plots which had received the following dressings of superphosphate per acre:—(1) No manure, (2) ½ cwt., (3) 1 cwt., (4) 1½ cwt., (5) 2 cwt. These plots afforded excellent material for the study of root development under these conditions.

Though the observations were not commenced until late in the season, the results as shown in Table I clearly indicate the effect of superphosphate on the depth of root penetration.

TABLE I.—Effect of varying quantities of Superphosphate on Root Development. Variety, Zealand.

	Greatest Depth of Roots									Yield of Hay*
Days after sowing ...	107	114	121	128	142	149	156	164	171	
	in.	in.	in.	in	in.	in.	in.	in.	in.	lb.
None	10	18½	22	26½	32	36	40	43	43	326
½ cwt.	13	22½	24	28½	35	40	45	46½	46½	431
1 cwt.	17	28	30	31¼	37½	42	47	49	49	464
1½ cwt. ...	17	28	30	30½	36	39½	45	46	46	422
2 cwt.	18	26	27½	30	35	39½	40	43½	43½	428

* Area of plots = $\frac{1}{10}$ acre.

It will be at once apparent from this table that superphosphate increases the depth of penetration. On every occasion when the observations were made, it was found that the roots of plants on the unmanured plot were the shortest.

It will be noted that the plot receiving a dressing of 1 cwt. per acre showed the greatest development of roots and the highest yield of hay. This is interesting, inasmuch as it suggests that 1 cwt. produces the best results on a large scale on this farm.

Though from the table it is seen that roots penetrated to a depth of 49 inches, this may not be the limit. The soil where these observations were made had a stiff, gravelly, clay subsoil at a dept of 3 feet 6 inches, and roots were unable to penetrate it freely, as evidenced by the convolutions of the roots at that depth. With a soil which has no such subsoil the roots may be able to penetrate to a depth of 5 feet or more. The second table shows the results obtained from a late-sown variety—Firbank.

TABLE II.—Effect of varying quantities of Superphosphate on Root Development. Variety, Firbank.

	Greatest Depth of Roots									
Days after sowing ...	61	68	75	82	96	103	110	117	124	131
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
None	4½	11	10½	14½	18	22	25½	29½	30	31
½ cwt.	8½	18	19	21	17½	24½	37	40	41	41
1 cwt. ...	10½	17½	18	20	30	34	37½	41	41½	42
1½ cwt. ...	9½	14½	18	19	29	31½	33	36	35½	36
2 cwt.	11	15	18	20	30	32½	36	38½	40	41

This table again shows clearly the stimulating effect of superphosphate on root development. The average root penetration is not so great as in the early-sown variety, due no doubt to the shorter growing season, but is still considerably greater than is generally believed to be the case.

While these figures show the results of observations during 1923, it must be remembered that that season was somewhat unusual, and that a normal season may produce even greater differences. The cold, wet spring certainly had an inhibiting effect upon growth, and several times little difference was noted between two successive weekly observations.

From the foregoing results it is obvious that superphosphate is not only valuable for its general effects, but also for the stimulus which it gives the young plants—the effect of superphosphate being most apparent during the early stages of growth—and especially the roots. This is an important feature, for where the available moisture is the limiting factor in plant growth, success or failure depend not only on the amount of moisture present in the soil and subsoil, but also on the ability of the roots to utilise

this moisture. Under such conditions the effect of superphosphate is most valuable, for it stimulates the growth of the young roots, enabling them to penetrate quickly into the deeper and moister regions of the soil, thereby ensuring a good supply of moisture. It is owing to this fact that a dressing of from 40 to 60 lb. of superphosphate per acre is described by many farmers as being "equivalent to 2 or 3 inches of rain."

This quick and deep penetration of roots can only be of value when there is sufficient moisture available for the crop, a state of matters which it is the object of a well-cultivated fallow to ensure. It has been found that a good fallow will store in the top 3 feet 9 inches of soil an amount of moisture equivalent to about 3 inches of rain more than unfallowed soil, and this moisture will be sufficient to give the crop a distinct advantage, especially when superphosphate is used.

Comparative Root Development of Varieties.

While the observations on root development were in progress the opportunity was taken to examine the root development of varieties with the object of finding any features of root development which characterised the varieties. The results obtained are shown in Table III:—

TABLE III.—Depth of penetration of Roots of certain varieties of Wheat.

Early-sown Varieties.

	Greatest Depth of Roots.								
Days after Sowing ...	**114**	**121**	**129**	**136**	**150**	**157**	**164**	**172**	**179**
	in.	in.	in.	in.	in.	in.	in.	in.	in.
Hard Federation ...	20	24½	27	32½	38	41½	47½	47½	47½
Gallipoli	18	21½	22	28	31	37	41	43	43
Canberra	23½	27	28	34	40	45	47	48	...
Bomen	24½	26½	28	31	36	39	42	44	...
Days after Sowing ...	**119**	**126**	**133**	**147**	**154**	**161**	**169**	**176**	**183**
Wandilla	26	27	34	40	43½	45	46	47	48
Warden	27	28	31½	39	41	43	44	45	...
Zealand	25	27	34	38½	43	45	44	45	...

Late-sown Varieties.

Days after Sowing ...	**60**	**68**	**75**	**82**	**96**	**103**	**110**	**117**	**124**
Improved Steinwedel ...	12½	14	23½	26	30	37	39	41½	41½
Firbank	9½	13	20	23	27½	31	34½	36	37
Days after Sowing ...	**61**	**69**	**76**	**83**	**97**	**104**	**111**	**118**	**125**
Clarendon	9	12	21	23	28	32	35½	37	37
Wandilla	8	14½	21½	26	28½	34	37	40	40
Days after Sowing ...	**62**	**70**	**77**	**84**	**98**	**105**	**112**	**119**	**126**
Canberra	11½	14	19	22	25½	31	36	36½	36½
Hard Federation ...	5	13	19½	23½	27	37	36½	38½	38½

Whether it was due to the methods adopted for observing root development or to climatic or other factors or not, no outstanding characteristics in root development were found. One feature is of interest, however—that of Improved Steinwedel. This is reputedly a drought-resistant variety, and yet is very "flaggy:" It was found to have the best root development and greatest depth of penetration. This, no doubt, explains to some extent its drought resistance, for the vigorous development of roots enables it to penetrate deeper, and consequently obtain a better supply of moisture than other varieties, and as a result it is less susceptible to a dry spell.

It will be noticed in the tables how closely the last two or three measurements coincide, due to the plants reaching maturity.

Conclusions.

In conclusion the salient features of the observations may be briefly summarised:—

(1) Superphosphate stimulates root growth, and enables the roots to penetrate quickly and deeply into the subsoil.

(2) A greater area of soil and subsoil is thereby rendered available from which the roots, and subsequently the plants, are able to withdraw moisture and plant-food.

(3) The need of fallowing is emphasised, to conserve moisture in the subsoil, if the best results are to be obtained from the use of superphosphate.

(4) While there are no outstanding differences in the root development of the varieties investigated, early sowing leads to greater root penetration than late sowing.

(5) The whole series of observations draws attention to the great depth of soil and subsoil in which moisture may be conserved, without going beyond the range of the plants' root system.

THE DANGER IN RATOONING COTTON.

IN Egypt and some other countries where the boll-worm is rife, it has been found necessary to introduce legislation prohibiting ratooning, and enforcing the destruction of old crops by a given date. Such measures were absolutely essential. After many years of slovenly methods, coupled with indifference to the advice offered by scientists, the very existence of the cotton-growing industry was threatened, and nothing but drastic action by the Governments would save it. It is obvious, of course, that where ratooning is practised the most important preventive measures against insect pests cannot be as thoroughly carried out as is possible where cotton is an annual crop. Growers who are obliged to ratoon, therefore, must concentrate on those operations that can be carried out; they should cut down their plants as early as is consistent with the welfare of the crop and see to it that no cuttings, leaves, or plant refuse of any kind are left on the land. Commonsense is much better than legislation.—G. E. SYMES, in the *Rhodesia Agricultural Journal.*

Wheat Varieties and Seed Selection.

H BARTLETT, Senior Agricultural Instructor.

THE popular varieties of wheat are changing so frequently, one being superseded by another of more recent introduction, that the proper characters of a useful wheat are well worth consideration. Of the many factors contributing to increased production per acre none appeals more forcibly to the farmer than a new variety which has produced a favourable yield in a similar and adjoining district, even if only over a short period.

Changes in a district's wheat varieties may be of a very marked character, or they may be less marked, according to whether they are—

(*a*) Changes in popular classes of wheat, such as from late to midseason, or from midseason to early wheats, such as from Zealand to Yandilla King or from Yandilla King to Canberra; or,

(*b*) changes in varieties in a particular class, such as Yandilla King to Turvey in the midseason wheats or Hard Federation to Canberra in the early wheats.

Prior to the introduction of the Farrer wheats, varieties in use were principally the purple straw types of wheat—late in maturing, tall growing, and flaggy, forming a high percentage of straw to grain, and requiring a very favourable growing period. The Farrer types of wheat partake of early maturity, short straw, sparse foliage, and high percentage of grain to straw; their demand upon soil moisture is less than that of the old wheats, and they are particularly suited to the drier portions of the State. Other plant-breeders have contributed valuable varieties, and it is rare indeed to see to-day a variety that was grown twenty years ago.

Such a change is one of class, and was particularly desirable. The growing of the midseason wheats has enabled the production of more reliable crops in the favoured portions of the wheat belt which have a rainfall of 20 inches or more per annum, and the early wheats have extended wheat-growing into the drier areas.

The early wheats have also found a place in all portions of the wheat areas, particularly so when late sowings are necessary owing to adverse circumstances, and herein lies the danger of the elimination of the naturally higher-yielding midseason wheats in centres where the autumn rains are erratic.

Nature generally conforms to the rule that late maturity favours high production, provided growing conditions are favourable, and the wheat plant is no exception. Experience has shown that midseason wheats, seasonably sown under favourable conditions, will produce larger crops than the early wheats. In the southern portion of the State midseason wheats predominate; on the Western Plains the early wheats are generally grown;

but on the Central-western Slopes and eastern portions of the plains, where the autumn rainfall is erratic, the class of wheat most in favour is not definitely marked, and shows a tendency to vary according to the previous seasonal conditions. So long as the change in class corresponds to the present seasonal conditions and prospects, the best returns may be expected, and the only practical safeguard to ensure that wheats will be sown in season is for the farmer to hold sufficient midseason and early seed wheat to meet his plans, plus an additional quantity of early-season seed wheat to take the place of the midseason wheat if the germination of the latter should be delayed beyond the end of April.

Such a system would mean that the sowing of the midseason wheats would not take place until favourable autumn rains were registered, and in no case in a dry seed-bed, thus largely avoiding the patchy germination that is common to April-sown wheat in the Central-western Slopes, when conditions are warm and rainfall generally light. Failing such rains, sowing would commence in May with Federation wheat, followed by the early wheats.

For several years (with the exception of the present season) the germinating rains in the Central-western Slopes have been delayed till early in June, thus favouring the early wheats, and there has been a tendency to eliminate the midseason wheats from the farms altogether. Such a change in class is not desirable, as the greatest average return will be secured by judiciously sowing the two classes of wheat.

Reduce the Number of Varieties.

Although opinion is fairly constant as to the best class of wheat for a district, the popular wheats of the class cover a large number of varieties. It is true that some varieties do better than others on particular soils and under certain climatic conditions, but this hardly justifies the growing of so many different sorts. It would not be difficult to name twenty varieties growing on commercial areas within a radius of 10 miles of any centre, each grower believing that the wheats he has chosen are the most suited for his farm. Many growers have six or more varieties—all good sorts, but some better than others—and, for the want of comparative tests, they are not in a position to reduce the number. This is a disadvantage, as, besides the direct loss from the lower-yielding sorts, more work is entailed when harvesting, and greater care is needed to maintain a purity standard of seed. Under present marketing conditions, the large number of varieties grown present no difficulties, but in the future, when bulk handling and consequent grading become general, a uniformity in the quality of wheat received at each centre will facilitate handling, and yet be of sufficient range to ensure an even quality of flour from the wheat of each centre.

Reduction in numbers of varieties is in the best interests of all concerned in the wheat-growing industry, and such a result is best brought about by each grower (and, further, each group of growers) deciding what wheats are most suited to local conditions.

Rejection of Wheats once Established.

Referring again to the frequent changing of the popular varieties, there are numbers that may be mentioned that at one time were widely popular, and yet to-day are seldom met with. Some possessed defects that were not apparent until affected by an adverse season; others were naturally of low-yielding capacity, but rose to fame upon their production during dry years, and have since been replaced by more prolific sorts. There are wheats that have fully justified their reputations, but that are losing favour through lack of care in maintaining quality.

Hard Federation, once in strong demand, is passing out of favour, because it is said to be disease-liable and because it is not yielding as well as some later introductions. Canberra, the wheat sensation of a few years ago, is tending to follow the same road. Federation, though generally accepted as the standard wheat of the west and south-west, has been condemned by some growers on account of it not being the same wheat as when first introduced. The heads, they say, have not the typical brown, robust appearance, the yield is lighter, and the variety is more disease-liable. A farmer at Bogan Gate lately remarked that he had grown Federation continually for fifteen years, but had decided to "cut it out." "But have you grown selected seed?" he was asked. "Well, I have always stripped the cleanest part of my crop for seed," was the reply.

Is it any wonder under such conditions that the popularity of varieties declines?

Florence, Bunyip, and Firbank are still occasionally met with. They are wheats of about fifteen years' standing, but the growers will be found to be men who have obtained stud seed at frequent intervals—proof that properly handled old varieties do not necessarily deteriorate.

Vitality of New Varieties.

In the production of a new variety, the plants have necessarily been subjected to rigorous selection over a number of years, such factors as yield and disease-resistance receiving particular attention. These characters have at first been bred into the variety, and then emphasised by selection, and when first removed from the breeding plots, the new variety possesses its maximum vitality and producing powers.

Is it not clear that recent introductions have a decided advantage over old-established wheats which have been continuously grown without selection? The new wheat may be more prolific than the old as tried, but possibly below the standard of selected seed as it originally left the hands of the plant-breeder. The natural law of reversion begins its work immediately a wheat is removed from the stud plots, and is accentuated with each successive year of reproduction.

Increase in Numbers.

When a new variety receives favourable comment, many farmers decide to give it a "good" field trial on an area of 10 to 20 acres. The high cost of seed, plus freight, cartage, and trouble, suggest that it must be sown on well-prepared land, and under favourable conditions. The yield being satis-

factory, the variety finds a home. Certainly some established wheat is sown alongside for comparison, but there are other wheats growing on the farm undei less favourable conditions, the yields of which are not comparable, but which are subsequently sown in reduced areas to make room for the new arrival. Within a few years the law of reversion will take toll of the producing and disease-resisting powers of the newcomer, and a new friend will in turn gradually take its place.

Such a system is not favourable to the farmer's financial interests. The only reliable system is to test the new wheat alongside all the established farm wheats, care being taken to ensure that all seed is of an equally high standard and sown under exactly similar conditions in plots of 2 acres each. The new wheat should not be sown on the farm areas unless it can definitely displace one of the older sorts.

Maintaining the Average Acre Yield.

With the frequent changing of the older sorts of wheat for those of more recent introduction of apparently higher yielding powers, an appreciable increase in a district's acre-yield should be expected. An increase is evident, but when due credit has been given to the effects of fallowing and manuring it is extremely doubtful if there is any balance to be allotted to the new varieties. The substitution of the high quality seed of the new varieties for the decreasing quality of the seed of the established wheats, maintains the average quality of the seed sown, and consequently prevents the yield from sinking.

It seems that new varieties are serving the purpose of maintaining the acre yield, and the suggestion is put forward that perhaps better results would be obtained by farmers concentrating more upon the established sorts, maintaining—perhaps increasing—their vitality and producing powers by a constant system of selection. It is not intended here to depreciate the value of new varieties, for something better is always possible, but a more thorough system of testing prior to the adoption of new sorts, and greater care of the established ones, would prove profitable.

Selection of Seed.

The improvement of a variety of wheat by a farmer—or at least the prevention of its depreciation in vitality and yield in his hands—is not a difficult matter. If 100 grains from a good plant are sown separately in a row, the resultant plants will show differences. The product of the best plant in the row will give better results than the product of the inferior plants, and if these are again sown by themselves they will, within a few years, give sufficient high quality seed for the requirements of the farm. This method is simply individual selection, and it is one of those followed by plant-breeders.

Another method is to select from a field crop just prior to harvest, sufficient of the best and most typical plants to give one bushel of seed, and to sow this separately. The product will sow a commercial area with high-quality seed. This method is called "mass selection."

Individual selection, though ultimately giving the best results, is a somewhat slow method, and requires a considerable amount of knowledge. It is quite possible, by unwise selection, to completely change a variety within a few years, and this system is, therefore, best left to the plant-breeder.

Mass selection is admirably suited for general adoption, and would prove profitable to all wheat-growers.

A Farmer's Experience with Mass Selection.

It is interesting to record one farmer's experience with mass selection.

About twenty-three years ago Mr. W. W. Watson, of "Woodbine," Tichborne, secured a small quantity of Turvey wheat from Victoria, and each year he has sown an area of this wheat, maintaining the quality by frequently practising mass selection. In 1922 the writer inspected his crop of Turvey, and observing slight variation in type, suggested that mass selection be again adopted. Sufficient selections were made to give 15 lb. of seed, which was sown alongside the ordinary bulk seed under exactly similar conditions. During growth the selected seed showed a more robust, uniform type of plant, larger, more typical and even ears. The differences were so marked as to be noticeable some distance away. The yield from the selected seed was 4 bushels per acre more than from the bulk seed.

Demand for Stud Seed.

It is well known that the Department of Agriculture has stud seed of many of the popular varieties of wheat for sale each year. But supplies are rather limited, and although only small quantities are sold to each grower, the applications exceed the supply.

To meet the demand, pure-seed growers have been selected by the Agricultural Bureau, and agricultural associations of the Central-western Slopes and Plains, the Department supplying, free of cost, 3 bushels of seed of the four established wheats in each centre. The grower will sow the product from these wheats on clean fallowed land, and the following year will sell graded seed wheat to farmers at a reasonable price above the f.a.q. price of wheat.

The growers are so situated that rail freights will not be necessary, the purchasers taking delivery at the farms.

The fact is again emphasised that "running out" of a variety is accentuated with each year's reproduction, and it will therefore be advisable to purchase supplies of pure seed annually from the pure-seed growers.

In selecting a dipping material, choose one which will remain in the wool for some considerable time, and so destroy any parasites which may hatch shortly after dipping. Remember that sheep must be thoroughly immersed for dipping to be successful.

Variety Trial with Potatoes at Orange.

A trial was conducted in conjunction with Mr. A. V. Tonking, Cargo-road, Orange. The season, though generally good, was not altogether favourable to potato-growing, owing to lack of rain during January and March, when the plants were flowering, and also owing to the frequency of strong, drying winds.

The rainfall during the growing period was:—November, 1923, 77 points; December, 423; January, 1924, 56; February, 278; March, 47; April, 226 points.

The soil was of basaltic origin, varying from a chocolate to a grey clay loam, deep, and free working; it was new land, which had been sown down to clover pasture and eaten out. Mouldboard ploughed in July, and again in September; springtooth cultivated in October; ploughed and sown on 12th November, the sets being sown in every third furrow 15 inches apart, and 2 feet 9 inches between the rows; superphosphate at 112 lb. per acre.

The crop received several cultivations during growth to keep down weeds and to preserve a mulch. The late-maturing varieties showed to best advantage; the plots were very free from insect pests and diseases.

The yields obtained were:—Late Manhattan, 4 tons 2 cwt. 3 qrs. 4 lb.; Langworthy, 3 tons, 8 cwt. 0 qrs. 8 lb.; Up-to-date, 2 tons 13 cwt. 3 qrs. 4 lb.; Early Manistee, 2 tons 5 cwt. 2 qrs. 25 lb.; Early Manhattan, 1 ton 18 cwt. 0 qr. 10 lb. The tubers harvested were good on the whole, being sound with clean skins; about 25 per cent. too small for market, and about 5 per cent. rather too large for ideal market potatoes.—B. M. Arthur, Agricultural Instructor.

Facilities for Visiting Experiment Farms.

"The main reason why the results obtained at our experiment stations are not fully appreciated by farmers," writes C. A. Dawson, in the South African *Farmers' Advocate,* "is that the average farmer does not know enough about what is being done and why it is being done at these stations. It is not necessary to agree with all that is being done, or to put into practice all that one sees being done; but it is worth while to visit an experimental farm whenever the opportunity can be found, and the better a farmer knows his business the more he can profit by such a visit, because he has a store of experience from which to draw comparisons and by which to arrive at conclusions."

The foregoing has also its local application. The facilities afforded for such visits by the New South Wales Department are apparently not generally known. Subject to a suitable date being arranged with the farm manager, the Department welcomes visitors to the farms, and has arranged with the Railway Commissioners for the granting of a reduction in fare for parties of six or more travelling for a continuous journey of not less than 25 miles. To members of such parties, on presentation of a certificate signed by the Under Secretary and Director of Agriculture, the return fare will be at the rate of single fare and one-third. This concession is not operative, however, on public holidays.

Condobolin Experiment Farm.

The Farm's Results Compared with the District.

W. H. BROWN, Editor of Publications.

When Condobolin Experiment Farm was established in 1912, it was with the principal object—so a contemporary document records—"of showing farmers in the district, or those working under similar conditions, how the teachings of science can be practically applied in a profitable way."

That the farm has had a certain distinct influence upon the farming of the district there is no reasonable question. On the other hand, there certainly are directions in which "the teachings of science" as exemplified there have not received as much attention from farmers as might have been expected. The impression is gaining ground, however, that the farm's results demand attention, and here and there are to be found men who have adopted part or the whole of the distinctive features of the manager's methods, while a disposition to discuss the returns is also to be found. When, too, the farmers attending the Bureau Conference at Parkes in April asked that the results obtained at Condobolin Experiment Farm should be published, they no doubt did so with the knowledge that crops better than those of the surrounding country have been obtained there year after year, and that therefore there is something to learn which so far has been missed by a good many.

In the first instance, it may be remarked that the area devoted to wheat around Condobolin has notably increased in the last ten years—the success with the cereal on the experiment farm no doubt having been a distinct encouragement to the development of the industry. In 1914 the area sown for grain was 9,082 acres, while in 1924 it had increased to 17,739 acres. The increase in the area intended for hay has been even more striking—in 1914 it was 539 acres, and in 1924, 5,669 acres.

It is when we turn to a comparison of the yields obtained on the farm with the averages for the district as compiled by the Government Statistician that it becomes apparent that farmers around Condobolin may with advantage compare their methods with the practical application in their midst of "the teachings of science." The interval between 1912 and 1924 has been perhaps the most trying in the history of that part of the west—the last six years in particular being a period of phenomenally low rainfall—yet there has never been a failure on the experiment farm, and in the worst year (1919) an average of 5 bushels was obtained from 80 acres. The average yield for the district that year was a quarter of a bushel per acre, from which it may be concluded that there were few crops indeed that even approached 5 bushels per acre.

Farm Averages and District Averages Compared.

Before proceeding to compare the figures for the farm with those for the district, it may be well to give the rainfall figures for the last few years. The average annual rainfall at Condobolin for over forty years, according to the Commonwealth Meteorologist, is 17·07 inches; but that is only half the story, for whereas down to 1916 the average for twenty years was 17·7 inches, the falls of the past eight years have been on a very different plane, as the following shows:—

Year.	Rainfall.	Year	Rainfall.
1916	2,543 points.	1920	1,847 points.
1917	2,397 ,,	1921	1,327 ,,
1918	1,232 ,,	1922 ..	1,180 ,,
1919 .	657 ,,	1923	1,063 ,,

That there should have been even a slight increase in the area under wheat in the face of such a rainfall is an eloquent testimony to the confidence of farmers in their district and to their own courage and determination. When that increase in area has been sufficient actually to double the figures it is surely evident that some factor has operated that has demonstrated that wheat-growing is profitable in the district. That factor, we cannot doubt, has been the consistent results obtained on the experiment farm. But there is another side of the picture which is worth more consideration. The yields at the farm have compared with the averages for the police patrol district of Condobolin as follows:—

	Condobolin Experiment Farm.			Condobolin Police Patrol District	
	Grain Yield per Acre.	Hay Yield per Acre.		Area	Average Grain Yield per Acre.
	bus.	tons.	cwt.	acres	bus.
1916	11	3	0	12,861	10·8
1917	16	2	0	12,911	11·6
1918	22	1	10	8,153	3·5
1919	5	0	10	6,485	0·25
1920	20	1	7	11,233	14·0
1921	18	1	0	18,478	7·9
1922 . ..	13	0	17	13,427	3·4
1923	11	0	10	17,739	3·9

The grain yield on the experiment farm averaged 14½ bushels per acre over the eight years, and the hay yield not far short of 1½ tons. Under strictly commercial conditions these figures would have been even a bit better, for varieties and methods that would not find a place on an ordinary farm have to be subjected to experiment from time to time, and these are included in the experiment farm averages.

But why district averages should thus, year by year, come short of possibilities (as indicated by the farm figures) might well engage the minds of all farmers within a good many miles of the old West Lachlan centre. They are figures that no one can afford to ignore who grows wheat, and they are

figures that, besides demonstrating that wheat will grow thereabouts, indicate (1) that with sound methods the industry is capable of paying a good deal better than at present it does, and (2) that the district is capable of supporting a large number of prosperous wheat-growers.

If the Manager, Mr. E. W. Kennedy, were asked the secret of the success of his farm, he would probably reply, " Thorough ploughing, careful cultivation of the fallow, early sowing, and superphosphate." In each respect the work of the farm is distinctly different from that of most other farmers around Condobolin, and the excellent yields obtained are the warrants for the differences.

The farm consists of about 1,200 acres of pine country, none of which can be said to be equal to the average wheat soils of the district. The best land around Condobolin lies to the south of the river, where the recent development in wheat-growing has been greatest, but on the north side the soil is lighter and of poorer carrying capacity. On the farm the soil ranges from a red sandy loam on the greater area to a medium loam; for the most part there is a considerable depth of soil and an absence of a defined subsoil, a good depth of soil being thus available for working.

About 400 acres are sown for wheat each year, about 400 acres are fallowed, some 50 to 100 acres (according to the season) are put under some silage crop, and the balance is reserved for the grazing of the horses and sheep.

Deep Ploughing.

Mr. Kennedy is a firm believer in thorough working of the soil. It is the common practice of the district to go only about 3 inches deep, but on the farm the first working (which is given in May or June) is never less than 4½ to 5 inches. One effect, of course, is to give the roots of the wheat a greater area of worked soil in which to grow, but there is another effect, and quite as important. In a hot district like Condobolin the loss of moisture by evaporation is very great, and it is essential that the subsoil be covered with a good deep mulch to prevent the loss. Let it be remembered that the object of a long fallow like this is to carry the rainfall of the winter through the following summer so that it may be available to germinate and nourish the crop when it is sown in the autumn. Only a mulch of good depth can do that under conditions like those at Condobolin. How much more efficient for this purpose is a cover of 4½ inches than one of 3 inches should be apparent. At any rate, the effect is manifest in the way in which crops on deeply-worked land outyield those where the working has been shallow.

An illustration of the way in which a deep mulch operates was afforded in the sowing season that is just over. On certain of the experiment plots a little mechanical difficulty was experienced with one of the drills, and the seed was sown a bit too deep. The effect was to put the seed right down on the moist soil, with the result that the seed germinated at once and

came away, whereas other crops sown in the district at the same time on shallower-worked land did not germinate until after rain fell. Admittedly, the seed should not have been sown so deep, for under most conditions it would not have germinated, or would have been weakened in getting through the soil to the surface, but in this case the prompt germination at any rate proved that moisture had been held in the deeply-worked soil, whereas it had not been so retained in soils that had had shallower working.

The value of deep ploughing was proved in another way some years back. In one paddock a block of 10 acres was ploughed 6 inches deep, another block was ploughed 3½ inches, and a third only about 2½ to 3 inches deep. On the first block the yield was 22 bushels per acre of cleaned seed-wheat, on the second 16 bushels, and on the third 8 bushels.

"It takes more horses to go 4½ inches deep, but it is worth it—one is a certainty and the other is not," was Mr. Kennedy's summing up.

The disc plough is preferred, as, indeed, it is throughout the district, it being found that it does quite as good work as the mouldboard—rather better, in fact—and it does it less expensively. In a season of anything like fair rainfall, there is a good deal of growth, and the mouldboard seems to choke and not to keep down to the depth. The disc plough cuts the herbage up and turns it under fairly well. The disc implement certainly leaves the ground a bit fine, but the rain is rarely sufficiently heavy to set the soil together.

Subsequent cultivations are effected with the springtooth cultivator, the implement being put well down the first time to bring the clods to the surface. Later workings are lighter, the soil being disturbed after each appreciable fall of rain, though not after very light showers. In all three or four workings are given between the fallowing and the sowing.

The fallow period is a long one—May or June until the following March or April—but the disposition is rather to lengthen than reduce it. In fact, last year some ploughing was done in view of fallowing as early as January and February, and the crop now growing on the ground is so promising that it encourages the idea that the earlier working is an advantage. The land appears to get more benefit from the summer rains if it is worked in February than if it is left in the stubble and ploughed in May. A fallow of fourteen or fifteen months looks a long one, but there is reason to think it may prove more profitable than even one of ten or eleven months.

Early sowing is the second distinctive feature of the practice of this farm. Many farmers around Condobolin sow as late as May, with the result that their crops are barely up before the ground becomes really cold, and only slow progress is made until spring, when heat comes in quickly (often with a bound), and the crops are drawn into a head before they have had time to develop the vegetative growth that is essential to a good yield—whether it be grain or hay. On the other hand, if the seed is sown early enough the crop makes good growth before winter, and has a sufficient

vegetative system by the end of August to ensure a payable crop, even if heat and dry weather should come in early and quickly.

Starting with the sowing of Firbank for hay as early as the third week in March, the drill is kept going through April, with the balance of the Firbank (for grain), then with the Canberra, Gresley and Billy Hughes. The whole of the driling operations are through by the end of April. The result is the wheat is well up before the winter, and when the cold suddenly gives way to heat in the spring the crop has made sufficient growth to mature a profitable yield. To this point a good many wheat-growers in the district might well give heed.

Fairly heavy seeding is practised, 60 lb. being used for the first sowings of Firbank, and though this is considered sufficient for practically all the grain crops, the quantity is increased to 70 lb. for the later hay crops.

Firbank is the popular variety in the district. Its chief recommendation is the quality of its hay, but it is also a useful dual-purpose variety, giving profitable yields of grain in good seasons. Stock display the keenest discrimination in favour of Firbank hay. It has been observed here, as on a good many other farms, that if horses are turned on to a paddock on which several varieties have been grown, the Firbank stubble is cleaned up before the others are touched. On one occasion maiden ewes were fed hay one day and silage the next, and their preference for the Firbank was manifest in the way they cleaned it up, leaving other varieties strewed upon the ground. If stock are fed on different chaffs, their preference for the Firbank just as definitely comes to light. A variety so relished by the farm animals, and so good a yielder under average conditions, must commend itself to farmers.

The quick maturing habit of Canberra makes it a most useful variety for Condobolin conditions. It is rather a better yielder of grain than Firbank, and sown from the middle to the end of April it crops well. Gresley is also proving useful for sowing in the latter part of April, and the same remark applies to Bill Hughes, though Firbank and Canberra appear likely to remain the principal varieties on the farm.

Every care is taken that only seed of good quality shall be used. The crop is harvested in the ordinary way, but the grain is subsequently put through the winnower to clean it.

Without Superphosphate—No Crop.

Superphosphate is essential to success with wheat in this part of the west—at least so the results on the farm indicate. Its effect upon the crop is most emphatic, and in dry years especially crops that have had no superphosphate have been absolute failures, while those that have been fertilised with it have given truly remarkable results. It seems to have a most definite influence upon root development, and pushes early growth along in a remarkable manner. The backward condition of the crops where no superphosphate was applied is most apparent.

In the season 1922 a trial with superphosphate in a paddock of Canberra resulted thus:—

No Superphosphate.	70 lb. Superphosphate.	90 lb Superphosphate.
4 bushels.	8½ bushels.	9 bushels.

High-grade superphosphate is being tested against the ordinary quality, but so far it is the latter that appears most valuable

The quantity of fertiliser used is varied with the time of sowing; at the beginning of the sowing season 60 lb. per acre is used, but the quantity is increased until towards the end of the sowing 80 lb. per acre is being applied.

The Place of Livestock.

In a district like Condobolin the maintenance of the humus content of the soil is somewhat of a problem. Crops like rape and field peas for feeding off have been tried, but without much success, the rainfall being too light for them. To be of maximum value for feed purposes, too, they should come away in the autumn, and for that February and March are usually too dry. It resolves itself therefore into a matter of utilising livestock as far as possible to feed off such growth as is available, and horses and sheep are turned on to the stubble, and sheep on to the fallows, though fallowed land does not yield a great deal of feed except in really good years.

It is interesting to find that Mr. Kennedy attaches quite appreciable importance to the horses on the farm in relation to soil renovation. He turns the horses on to the stubble first and the sheep some while later, considering that the best use is made of the feed in that way.

It is instructive to find that even under such conditions as these—where crossbreds for the raising of fat lambs are out of the question, and where only merinos for their wool can be run—sheep are an essential to successful wheat-growing. Some 200 acres are kept for the grazing of the 300 sheep usually on the farm, and, in addition to the pickings afforded by the stubbles and the fallows, a good deal of silage is fed.

Surprise may be felt that silage should form any appreciable part of the programme in a place of such light rainfall, but by careful management the manager succeeds in having a useful reserve at the beginning of most bad seasons. In 1916, for instance, 150 tons were made; in 1920, 120 tons; in 1922, 35 tons; and in 1923, 120 tons. With a fair season, another 100 tons or more will be put in the pits this season. A preference is entertained for Cape or Skinless barley for this purpose, but in most seasons a suitable crop of wheat has to be selected, and the yield varies from 1 ton to perhaps 5 or 6 tons per acre.

The silage itself no doubt has some influence on the humus content of the soil, for 200 or 300 sheep cannot be fed 3 lb. per head per day without the land benefitting.

The silage is conserved in two large pits, 70 or 80 feet long, 25 feet wide, and 5 or 6 feet deep. It will be noticed that the pits here are wider than on some farms, and when the point was mentioned it was explained that a better consolidation is obtained than when the sides are close together.

The sheep thus have their value in relation to the maintenance of fertility, but they also earn a very acceptable cheque for their wool—a circumstance of which farmers in the district should take notice. The following table shows the number of sheep grazed on the farm from year to year, and the amount of the wool cheques:—

	No. of Sheep Run.	Amount of Wool Cheque.
		£ s. d.
1918 ...	284	147 11 1
1919 ...	376	208 19 7
1920 ...	237	187 6 5
1921 ...	151	139 0 9
1922 ...	300	159 0 10
1923 ...	320	240 18 8

An interesting feature of the farm is the portion devoted to a series of variety trials of wheat, oats, and barley, and to various treatments with superphosphate. The plots are situated along the main road and within easy view of the railway, and are beginning to attract deserved attention from farmers. The farm has certainly not been without its effect upon local practice, as already stated, and these attractive experiment plots should have their share in enforcing some of the lessons. A good deal of interest attaches to the trials with oats—at one time almost unthinkable as a feature of farming in this part—but now, thanks to the plant-breeder's devotion to the subject, they are beginning to assume some significance. The new varieties have completely brushed Algerian aside, and Mulga, Lachlan, Buddah, and perhaps Yarran should be watched by farmers as likely to be of considerable importance to them at an early date.

The Problem of Pest Control.

Many an isolated fact, apparently of no economic importance, has subsequently proved to be a vital link in a chain of facts that have a far-reaching practical value. Instances might be multiplied from all over the world where much might have been done to control insect pests with a minimum of delay if only more had been known beforehand as to their life-history and distribution. If, for instance, we had known fifteen to twenty years ago what we know now about the pink boll-worm of cotton (*Platyedra gossypiella)*, which is probably indigenous only in India, and is an imported pest in Egypt and elsewhere, what vast sums of money could have been saved, and how much better the prospects of controlling this most serious menace to the cotton crop of the world would have been!—S. A. Neave, in *The Empire Cotton Growing Review.*

Fallow and Crop Competition.

PHILLIP AGRICULTURAL BUREAU.

MARK H. REYNOLDS, Senior Agricultural Instructor.

EARLY in 1923 it was decided by Phillip branch of the Agricultural Bureau to conduct a competition among its members to ascertain the best system of fallowing for wheat under local conditions. The limit in area for each entry was fixed at 25 acres, and a scale of award adopted which allotted a maximum of 30 points each for moisture content, condition of mulch, freedom from weeds, consolidation of subsurface, and cultivation.

The whole of the land entered was within a 2-mile radius. The rainfall registered on three of the competitors' properties was as follows:—

	W. A. Hombsch.	G. B. Hombsch.	J. D. McLennan.
1923.	Points.	Points.	Points.
July	165	....	....
August	63	56	....
September ...	217	185	205
October	115	55	169
November ...	101	185	108
December	268	258	314
1924.			
January	251	287	304
February	495	546	593
March	117	237	84
April (to 9th) ...	49	195	247

Judging of the fallows took place on 10th and 11th April, and was made difficult by the washed condition of several of the plots, caused by heavy rain some few weeks earlier.

DETAILS OF AWARDS.

Competitor.	Moisture.	Mulch.	Weeds.	Consolidation.	Cultivation.	Total.
	Points.	Points.	Points.	Points.	Points.	Points.
G. S. Baker	29	29	29	29	29	145
S. Titcume	29	27	29	28	27	140
G. B. Hombsch (No. 1, upper paddock)	29	26	29	28	27	139
G. B. Hombsch (No. 2, lower paddock)	29	26	29	27	27	138
W. A. Hombsch...	28	25	28	26	26	133
E. Horsburgh	26	25	27	23	24	125
F. W. Hombsch	26	24	23	26	26	125
J. D. McLennan (No. 1)	25	24	25	23	23	120
G. Forge	22	23	23	22	23	113
J. D. McLennan (No. 2)	21	22	22	22	21	108

The Winning Fallows.

G. S. Baker.—Land sloping gently to the west; light red loam overlying red clay a few inches from the surface. In 1922 the land was cropped to wheat, a 12-bushel crop being garnered, free from bunt and other diseases. The land had been cultivated for seventeen years, and cropped with wheat about twelve times. No fertiliser had at any time been added.

Ploughing was carried out in the early part of August to a depth of about 4 inches. After good rain on 4th September, the land was harrowed up to 7th September, and after 72 points in October (about the 22nd) it was again harrowed. From 3rd November, 250 sheep turned into the paddock (about 60 acres in area), and were allowed to remain there on and off until April to keep weed growth in check, but very little growth of any kind occurred. From 1st to 3rd January a tine cultivation was given 3 inches deep, and a similar cultivation was given about 1st April.

This entry was outstanding by reason of its coarse (cloddy) surface mulch, and the good subsurface consolidation.

S. Titcume.—Red loam soil on undulating country; subsoil a stiff clay 6 inches from the surface. Cropped with wheat in 1922, 18 bushels to the acre being harvested. The land had been cultivated since 1907, about eight wheat crops having been grown during the past twelve years.

From 26th September the land was ploughed 4 inches deep with a stump-jump plough. Cattle were run on the fallow on occasions until the end of the year to keep weeds in check. In mid-January the land was again ploughed 4 inches deep. It was harrowed during the first week in February, cultivated about 7th March, and harrowed on 25th March, when the soil was so loose that the light harrows went in deeply.

The surface mulch was on the fine side, but was in good condition. The consolidation reached too near the surface compared with Mr. Baker's fallow. The soil was apparently more fertile. It was a very worthy effort in fallowing.

G. B. Hombsch.—The soil of the blocks entered by this competitor varied, but mainly consisted of a light red loam overlying a clay to shale subsoil. The land was gently undulating. In 1922 an 18-bushel crop of wheat was harvested. The land had been under cultivation since 1907. Soil scour had occurred to a slight extent.

The cultivation of the upper paddock consisted of a 2½-inch discing of portion, and the spring-tooth cultivation of the remainder in March. From the preceding harvest until April sheep were kept in the paddock cleaning up the straw stubble and weeds. The land was harrowed once in June, by which time a fairly thick growth (mostly of wild oats) had occurred. In mid-September a 4-inch cultivation was given with a mouldboard stump-jump plough, which turned in a 6-inch growth of wild oats, and on 20th October the land was harrowed to reduce the size of the clods. On 1st, 12th, and 29th January it was again harrowed. From 4th February a 2½-inch skim ploughing was given to kill weeds (chiefly paddy melons). On 12th

February an effort was made with weighted harrows to tear out the paddy melon vines. On 12th March a 2½-inch skim ploughing was carried out, and on 1st April another harrowing was given. Notwithstanding all this cultivation, some plants of *Eragrostis major* grass were still growing. Although the stock ate this grass in its young stages, they neglected it when more mature. The efforts necessary to keep the weeds in check caused an over-fine and worked-down surface.

The cultivation of the lower paddock consisted of a 4-inch mouldboard ploughing, July-August, 1923, and harrowings in September and October. It was harrowed on 1st and 12th January, 1924, skim-ploughed on 31st January 2½ inches deep, harrowed 13th to 17th February, skim-ploughed 20th to 24th March, and harrowed 31st March.

This fallow had been washed a good deal and the surface had run together. The mulch and cultivation were too fine, and consolidation was thereby carried too close to the surface.

Summary.

Owing to the deficiency in rainfall until late in December, most of the operations were carried out with the soil on the dry side. These workings brought it into such a condition that the ample rainfall from January to March caused prolific weed growth, of *Eragrostis major* especially. In an endeavour to maintain a weed-free condition, the soil was worked into too fine a state near the surface, and considerable erosion was caused by the autumn rains.

THE SIGNIFICANCE OF MACHINERY TO AGRICULTURE.

VERY little agricultural machinery is being bought to-day, and until there is more money in agriculture very little will be bought; but the ultimate success of agriculture will depend more upon the economies of power and the machine than upon any other external aid. Just as in manufacturing industry, the use of power will tend to larger scale production, to bigger economic units; but, after all, that is what is really meant by co-operation, the development of which will itself develop the use of power and machinery upon the farm.—H. G. RICHARDSON, in the *Journal* of the Ministry of Agriculture, London.

A NOVEL TYPE OF SILO.

DURING the past few years ensilage has gained considerable favour among arable farmers, and the tower silo is becoming a familiar feature of farm steadings. Tower silos are being made of various materials, and in the neighbourhood of Worcester there may be seen three silos which were at one time the funnels of an Atlantic liner. These have been in use for a number of years, and give good results.—J. R. BOND, in the *Journal* of the Ministry of Agriculture, England.

Farmers' Experiment Plots.

POTATO TRIALS, 1923–24.

The Dorrigo Plateau.

W. R WATKINS, Agricultural Instructor.

IN addition to the North Coast potato plots, upon which a report was published in the August issue of the *Agricultural Gazette*, a trial was conducted on the Dorrigo plateau at the farm of Mr. H. Short, "Warrawee."

The plots were planted on 7th, 8th and 9th August, the ground being in good order. The soil was a red volcanic loam of loose and friable texture. The plots were planted in virgin land, in drills 2 feet 9 inches apart, 12 inches between sets, and 4 inches deep in the drills. The germination was good throughout.

The plants made a good start following the rain of August, but the dry spell in November caused the haulms to take on a very dry appearance. Up to this time only very small tubers had formed and by the middle of December it was decided to dig the crop, as the haulms had practically died off. However, about 20th December rain fell and showers continued till the end of the month, and the same weather was experienced throughout January, just on 7 inches being registered for the two months. Early in January it was seen that the haulms had recovered and were making rapid growth, and the tubers also began to fill out and a new "bottom" growth to form. Towards the end of February the plots looked splendid, the haulms having reached a height of from 2 feet 6 inches to 3 feet and of good healthy colour. By the end of March the crop had matured, and it was seen that good yields would be obtained, the tubers being of good size, clean and healthy throughout, and showing very little sign of second growth. The crop was very clean and free from any disease or pests. To have seen the plots in March one would have naturally thought it an autumn crop instead of having been spring planted. Harvesting commenced in April, and through delays caused by heavy falls of rain during April, May and June, was not completed till July, the tubers having kept better than if they had been stacked or pitted, though over 20 inches of rain had fallen from the time of maturity. The outstanding feature of the plots is how they recovered from what seemed a rank failure four months after planting, and gave the yields shown. It will be seen by the percentages of marketable potatoes that there were only a few "marbles."

It will be noted that the falls of rain for eight months are shown, but it was practically only the last four months from which the crop benefited.

	Points.		Points.
August (from 9th)	355	January	384
September	177	February	465
October	252	March	728
November	14		
December	302	Total	26·77

RESULTS of Variety Trial.

Variety.	Marketable Potatoes.	Yield per acre.	Variety.	Marketable Potatoes.	Yield per acre.
	Per cent.	t. c. qr. lb.		Per cent.	t. c. qr. lb.
Langworthy ...	68	7 2 0 25	Factor ...	84	8 16 0 10
Early Manistee ...	85	6 6 1 19	Coronation ...	70	6 13 0 22
Early Manhattan ...	75	6 8 2 20	Arran Chief ...	72	6 6 1 19
Symington	90	7 4 1 26	Scottish Triumph..	75	8 2 2 4
Satisfaction	...	3 12 0 27	Batlow Redsnooth	...	2 5 0 17
Early Rose	78	6 10 3 21	Tasma ...	74	7 6 2 27
Up to Date	80	6 15 1 22	Teasdale ...	70	7 2 0 25
Surprise	75	5 8 1 12	Dakota Red ...	76	6 19 3 24
Carman No. 1 ...	85	8 7 0 6	Cook's Favourite...	78	8 9 2 19
Queen of the Valley	75	6 10 3 21	Red Ruby... ...	80	5 8 1 12

RESULTS of Manurial Trial.

Variety.	Manure per acre.	Yield per acre. t.	c.	q.	lb.
Langworthy	No manure	7	13	2	7
„	Superphosphate, 2½ cwt.	8	0	1	4
„	„ 5 „	9	9	2	15
„	P9, 4 cwt.	7	13	2	1
„	P7, 2½ „	7	15	3	2
„	M7, 3¼ „	8	4	3	5
„	No manure	6	10	3	21

The mixture P9 consists of 3 parts of sulphate of ammonia, 10 parts of superphosphate, and 3 parts of chloride of potash. P7 consists of equal parts of superphosphate and bonedust. M7 consists of 10 parts superphosphate and 3 parts chloride of potash.

The average of the unmanured plots is 7 tons 2 cwt. 0 qrs. 25 lb., so that the application of fertiliser proved effective, especially superphosphate at 5 cwt. per acre and M7.

Factor gave the highest yield, being a medium sized, clean-skinned variety of even shape, and a good table potato. Next in order came Cook's Favourite, Carman No. 1, and Scottish Triumph, all yielding over 8 tons. Symington showed great resistance to dry weather, being quite on its own in this respect; it yielded well, the tubers being of good marketable shape and size. Satisfaction being an early variety was too far advanced to respond to the rain in December. Batlow Redsnooth was the only one that germinated poorly, and those plants that grew yielded well.

Sheep will only become infested with lice or ticks through coming in contact with other infested sheep, or by being placed in yards, sheds, etc., in which infested sheep have lately been kept.

Rhizoctonia Scab in Potatoes.

R. J. NOBLE, Ph.D., Principal Assistant Biologist.

THERE are three common causes of scab in potatoes, two distinct types result from the action of fungous parasites and the third is caused by eelworms.

Rhizoctonia scab receives its name from the fungus (*Rhizoctonia solani* Kuehn) which is the cause of the disease. This fungus is readily recognised on affected tubers in the form of small black masses or lumps, which vary greatly in size and shape. On account of this feature the disease is sometimes called "black speck scab" or "black scurf." The fungous structures at first sight appear like lumps of soil, but they show up distinctly black when wetted and they do not wash off. The superficial position of the fungus sometimes leads growers to think that the disease is of little importance. The black bodies, however, represent the resting stage of the fungus which is able to develop rapidly under favourable conditions.

Tuber showing scab due to *Rhizoctonia solani.*

Generally speaking the disease results in most damage under cool moist conditions. It may attack any of the underground portions of the plant. The young growing shoots may be entirely destroyed. In other cases the disease may develop on the underground stem, stolons or roots, where it is readily recognised in the form of brown discoloured areas. When the stem is severely attacked, or when the stolons are girdled, a number of small tubers may be produced on the stem and in axils of the leaves. Frequently also the leaves become bunched in the form of a rosette.

Unfortunately the fungus is able to live in the soil in the absence of the potato plant and it may grow on a number of other root crops and grasses. Once a soil becomes heavily infested little can be done to exterminate the disease. In most instances, however, the disease arises from the use of untreated, diseased tubers.

Every care should be taken that the disease is not introduced at the time of planting. Clean selected seed should be used whenever possible. This, however, is not always practicable, but effective control may still be obtained by seed treatment in a fungicidal solution of either corrosive sublimate (mercuric chloride) or formaldehyde.

Dipping the seed before sowing should be adopted as a general practice, and, generally speaking, corrosive sublimate is more effective than formaldehyde for this purpose.

A caution is necessary. Corrosive sublimate is a deadly poison if taken internally by stock or by human beings. The solution, however, is quite harmless on the hands. Treated potatoes are unfit for domestic use or for feeding to stock.

The solution is made up of corrosive sublimate (mercuric chloride) 1oz. and water 6¼ gallons. The corrosive sublimate should be dissolved in about a quart of warm water and then diluted to the required amount. A wooden vessel should be used since the chemical will attack metal and thus lose it strength.

The seed potatoes should be immersed for from 1½ to 2 hours. It is inadvisable to dip the potatoes in bags, since this weakens the solution. It is far better to place the tubers directly in the solution or else to use a small wooden crate.

The solution should not be used for more than three batches at a time. This is particularly necessary if there is much dirt adhering to the tubers, as there is then a tendency for the solution to weaken very rapidly. The tubers should not be cut and preferably should not be sprouted. If they have sprouted slightly every care should be taken not to injure the sprouts and the time of dipping should be shortened.

It is a good plan to keep the tubers moist for 24 hours before treatment to loosen the dirt and soften the fungous material, which is then more readily killed by the fungicidal treatment.

Farm Women's Institutes in Belgium.

Interesting details concerning the Belgian Farm Women's Institute movement appear in a recent issue of the *Journal* of the Department of Agriculture and Technical Instruction, Ireland. These circles were first founded in 1906, and by 1910 there were seventy-four circles with a membership of 6,929, while in 1922 there were 553 circles with a membership of 47,067. The circles are associations of women and young girls living in the country, and their aim is to look after the material and moral well-being of their members, and to encourage proficiency in their work and progress in their social and religious life. They are local organisations, and are adapted to the particular needs of each district, and, where possible, work in conjunction with the farmers' circles.

These circles endeavour to attain their aim by means of technical instruction (in the shape of lectures, practical courses, libraries, &c.), the improvement of working conditions, housing, &c., the organisation of mutual aid societies, co-operative societies, &c., instruction to mothers on the rearing of their children (from the physical, intellectual, moral, and religious points of view), and social gatherings.

The Ministry of Agriculture aids these circles by providing lecturers, lending books, and by giving small grants.

The Co-operation, Community Settlement, and Credit Act.

Its Scope and Principal Provisions.

H. A. SMITH, Registrar of Co-operative Societies.*

The Co-operation, Community Settlement, and Credit Act of 1923 provides for the first time in New South Wales an adequate statutory basis for the organisation of co-operative societies upon modern principles, and has been passed with the object of assisting those of like interests, whether in town or country, to combine for the improvement of their conditions, economically and socially.

The former Act was antiquated and so defective that many co-operative enterprises were registered under the Companies Act, and some of recent origin have not seen any advantage in registering at all. The new Act, however, gives to co-operative societies a definite legal status, with privileges appropriate to their objects. The title "co-operative" as part of a trading name is protected from abuse, and none but registered co-operative societies are permitted to use it. A society, too, has privileges not given to companies, and its members have more protection. It is registered and incorporated free of charge, and is granted exemption from stamp duty and from State income-tax in certain respects; it has specific powers as to borrowing by issuing bonds and receiving deposits, and the right to make loans to members in certain cases, and to have dealings with them which in the case of public companies are illegal as in restraint of trade.

The proper conduct of the society is safeguarded in that provision is made for the keeping of proper accounts and their audit by approved persons, for the making of annual returns to the Registrar, and for the limitation of borrowing, while officers are required to provide a fidelity guarantee. Moreover, societies may be inspected by the Registrar, either upon proper application by members, or upon his own initiative, should he deem it necessary. But, apart from these differences, the root idea of a co-operative society is entirely different from that of a joint-stock company, and it follows that the legal conditions governing it should be appropriate to its special needs.

The co-operative society is an association of persons to render services to its members as economically as possible. Its purposes may be to sell products or purchase requirements for members on the most favourable terms, to acquire and operate on behalf of members some factory, woolshed or packing-shed, or some expensive piece of machinery or costly breeding stock, or any public utility, or any other common requirement beyond the individual means of its members. On the other hand, a society might

* Extracts from an address at the second annual State Conference of the New South Wales Agricultural Bureau, at Hawkesbury Agricultural College, June, 1924.

be formed with the idea of obtaining credit on favourable terms for the use of its members under their joint guarantee. The true co-operative society, therefore, does not carry on business to earn profit on capital invested, but to enable co-operators to obtain their requirements, or to effect savings.

Thus the special objectives of the co-operative society require that it be organised on a democratic basis. This basis is that of the individual member and not of the amount of share-holding. Under the Act the amount of shares which may be held by one person (except in special cases) is limited to £1,000, or to one-fifth of the total shares of the society, whichever is least, and under the rules of the society a minimum share-holding must also be fixed. Except in a Rural Credit Society, the liability of every member must be limited—in a Rural Credit Society it may be limited or unlimited. Although a dividend not exceeding 8 per cent. per annum may be paid in respect of capital, the surplus earnings of the society are generally distributed among members in proportion to the use they make of the society. Non-members who trade with the society may not share in its surplus earnings until they become shareholders, although dividends may be credited to them for that purpose.

Any person eligible under the rules for membership may join a society, and its share list may not be closed. Thus there can be no speculation in its shares, and persons who do not intend to use the society are discouraged from joining it.

Members may exercise only one vote, except where up to two additional votes are allotted to them on the basis of the use made of the society or the number of shares held. In order to prevent abuses, no person is allowed to act as proxy for more than five others.

These provisions ensure that the co-operative society will be democratically conducted by the persons who use it.

The Kinds of Society Provided for.

In the Act, eight distinct kinds of societies are provided for, each with a wide range of functions. These may be grouped in pairs as follows:—

The *Rural Society* and the *Trading Society,* intended in the main as societies for marketing and buying, although they may make provision for the manufacture, handling, and storage of products, and a trading society may carry on any business, trade or industry.

The *Rural Credit Society* and the *Urban Credit Society,* intended to improve the financial position and to make available small loans for short terms.

The *Community Settlement Society* and the *Community Advancement Society,* for promoting settlement and providing any community service or benefit.

The *Building Society* and the *Investment Society,* through which members may make investments—in the former case in homes or other real property, and in the latter in the shares of societies and companies or in other prescribed securities.

While the farmer as a citizen might have a general interest in all these, those of special concern to him as a farmer are the Rural Society, the Trading Society, the Rural Credit Society, and the Community Advancement Society.

A further description of these may be given.

How the Societies may Operate.

The *Rural Society* may act for its members in a large variety of ways. For example, it may collect and transport to a central co-operative agency the rural products of its members before disposing of them; it may manufacture or treat those products in any way or provide storage or refrigerated space for them; or it may open a store for retailing any farm or household requisites to its members or other persons. Beyond this, it may acquire and make available for use by its members such general requirements as breeding stock, machinery, or transport facilities, and it may arrange insurance or engage employees on behalf of members. It may also contract to carry out farming operations for members, employ experts to assist them in their work, collect information as to market conditions and distribute it among members.

Added to this very useful field of activities are the powers prescribed for a *Community Advancement Society,* any of which may be exercised by a Rural Society. Stated broadly, the object of a Community Advancement Co-operative Society is to provide any community service or benefit such as transport, supply of water, gas or electricity, to maintain any industrial establishment, or to provide grounds and buildings for recreation and education, or to promote and carry on any charitable undertaking.

In furtherance of its objects, a Rural Society may raise money on loan, issue bonds, receive money on deposit, and make advances to members against products delivered to it. Perhaps the aim of the Rural Society may be described as co-operative marketing, with all that it implies in preparing products for market, although it may take a large share in co-operative production. As a community organisation, it has the option of promoting the development of the community in which it functions.

Where a society is not required to market the products of members, but is intended to carry on operations embraced by the terms "business, trade or industry, wholesale or retail," especially in regard to the buying and selling of land or in timber-getting, the most appropriate form is the *Trading Society,* which may, however, purchase the products of members for purpose of resale in the ordinary course of its operations, but may not engage in marketing operations as prescribed for a Rural Society.

In view of the importance of the problem of finance, a very useful form of co-operation has been developed to provide rural credit. Nearly all the leading countries of Europe now have very extensive systems of co-operative credit, while in Ireland, the United States, and Canada considerable headway has been made. It is acknowledged that the local banking system at present leaves a large part of the farmers' needs unsupplied both as regards

mortgage and short-term loans. Although the Rural Bank has recently been established to extend both kinds of accommodation to persons engaged in rural industries, a system of rural credit societies is needed to complete the requirements of a scheme of rural finance.

The *Rural Credit Society* is empowered to raise loans and to receive deposits, while the share subscriptions of its members are also a source of capital. Its functions are to make, arrange, or guarantee short-term loans not exceeding £300 to its members for reproductive purposes, such as purchasing machinery, livestock, fodder, seeds, trees, fertilisers, &c., making improvements to their properties, or carrying on farming operations, or for paying off a debt incurred for any such purpose. In the course of its operations, it may purchase goods or sell products on behalf of its members, or arrange insurance for them.

In order to safeguard its funds, it has power to supervise the expenditure of loans by its members.

How they may Combine.

The foregoing are the principal kinds of society of interest to the farmer. Let us consider how these may combine for joint action.

In the scheme of co-operative organisation contained in the Act the member is the unit. Individual members may form co-operative societies, co-operative societies may form co-operative associations, and co-operative associations may form co-operative unions. A co-operative association may consist of two or more co-operative societies of the same kind. Its objects are to facilitate the activities of its component societies, and to act on their behalf in matters of common interest.

For example, it might be a central marketing agency, a propagandist and organising body, or a means of securing funds for its member-societies, or it may combine the whole of these functions. Subject to its rules, an association may do any of the things that a component society may do, and in addition, if its member-societies required the assistance, it might employ experts to render service, supervise their affairs, audit their accounts, raise funds to assist them, and conduct propaganda in favour of co-operation. Associations of rural and trading societies may join in the course of their business with similar organisations registered in other States or countries.

Two or more co-operative associations, whether of the same kind or not, may form a co-operative union, and in special circumstances a society may be admitted to membership of a union.

The union, therefore, provides a means of joint action by the associations, which are federations of societies. It may render services and act on behalf of its component associations and societies in any manner not inconsistent with the Act, and in particular its functions are to promote co-operation, to encourage and assist in the formation of co-operative societies, to assist in the conduct of their business where required, and to audit their accounts. It has power to raise money on loan and to receive deposits. With these funds it can make advances to its component associations and societies for carrying out their specific functions.

This provision adds greatly to the financial strength of the system, and provides a means of supplying loans on favourable terms to weak societies.

Preliminary Considerations.

Such are the principles of co-operation as implied by the Act. How are they to be applied?

Competent authorities in other lands assert that successful co-operation can be founded only upon economic necessity, but while it is undeniable that a society is not likely to succeed unless it fulfils some useful and necessary economic function, it is possible to over-estimate the need of waiting for a "crisis" to arise before embarking upon co-operative ventures. It is essential, however, for the way to be well prepared before a co-operative enterprise be formed. The objects and scheme of business must be planned carefully beforehand. Facts and figures should be gone into. Prospective members should be canvassed to ascertain the degree of support they are prepared to give, and the question of finance especially should be closely studied. Indeed, the Act requires something of this kind by providing that a written statement setting out reasons for believing that the society will be a success must be presented to the inaugural meeting.

If the society is born prematurely, it starts with a weak constitution and is in danger of expiring in the first encounter with adversity. It would be well, therefore, to reduce the business relations between members and their society to the definite basis of a contract. This method has been successfully applied in America, and our own Act gives co-operative societies a statutory right to make contracts with a member, binding him to have certain dealings with the society for a fixed period, under penalty of specified or, as they are called, liquidated damages. This is a right which companies do not possess, since such contracts may be in restraint of trade. The Co-operation Act, however, especially validates them as far as co-operative societies are concerned, and the provision should prove of immense utility to societies, enabling them to ascertain with reasonable certainty the amount of custom upon which they can rely before they incur the expenditure incidental to formation.

Usually it has been found that conditions are most favourable to form a co-operative society where the area covered is compact, and where a definite community spirit exists or can be cultivated. Indeed, the condition is considered of such importance in regard to co-operative credit that the Act provides that the district of a Rural Credit Society may not extend beyond a limit of 15 miles from the registered office of the society.

How to Proceed.

Having decided these important preliminaries, the promoter of co-operative organisations is next faced with the question of how to proceed.

The first thing to be considered is the requirements of the Act under which the society is to be registered. All necessary information upon this matter may be obtained from the Registrar of Co-operative Societies, who

will supply copies of the model rules and prescribed forms gratis. Copies of the Act and of the Regulations may be purchased at the Government Printing Office.

Briefly, a society must be formed in accordance with the requirements of the Act, set out mainly in Section 39. There must be an inaugural meeting, attended by at least seven adult persons qualified to be members of the society, and at this or a subsequent meeting a prospectus and the proposed rules must be considered. When seven or more qualified persons sign an application for membership, the society may apply for registration. Upon registration, a certificate of incorporation is issued to the society.

The foregoing indicates some of the opportunities which are presented to farmers by the Co-operation, Community Settlement, and Credit Act of 1923. An Act of Parliament, however, upon such a matter can provide little more than the machinery. The basis of the new Act is self-help, and the motive force for the machinery must be supplied by the zeal and intelligence of the community.

Beliefs: Ancient and Modern.

It is true that agricultural education is relatively new, and naturally many mistakes have been made. Agriculture is mankind's oldest industry, and the traditions of the ages cannot be wiped out in a day or prevented from exerting a powerful influence on new developments. Sufficient unto itself for thousands of years, it is only natural that the first impulse of agriculture in this new era was to make direct application of each bit of new information that came into its possession. Steeped in the traditional belief that "if you want a thing well done, do it yourself," agriculture has been slow to embrace the modern belief that "if you want a thing well done, hire an expert."—H. P. Rusk, Department of Animal Husbandry, University of Illinois.

Pruning and Orchard Competitions.

For some years pruning competitions have been conducted by branches of the Agricultural Bureau in South Australia, and a good deal of interest has been awakened in that and in other States. Lately the fame of these competitions spread to the United States, and (according to the *Journal of Agriculture*) there appears to be a possibility of similar contests being conducted there. Giving some information, the South Australian Instructor in Pomology (Mr. W. P. Duruz) remarked that the "contests are designed primarily to stimulate interest in better methods of growing and a higher quality of fruit." A record is kept of the work done in the orchard, the crops produced, and the returns, and after the crop has been removed the orchard is judged by a representative of the Department on the basis of the condition of the trees as regards health, vigour, fruit bud formation, &c. The competitions have brought out many points of interest, and "the average production for a district has been raised as a result," the interest aroused by them proving a great stimulus to fruit-growers. Mr. Duruz adds, "We believe that these contests are more valuable than any other feature that has been introduced into horticulture in recent years."

Dairying Industry in New South Wales.

Review for the 12 Months July, 1923, to June, 1924.

L. T. MacINNES, Dairy Expert.*

CLIMATIC and weather conditions enter so much into our primary production industries that in any review of the industry they must be considered at the very beginning. The conditions prevailing in the States of Victoria and Queensland must also be noted, for they, being large dairying centres, have a marked effect on our markets. Australia is a huge country, and at any one period of the year extremely good and extremely bad producing and manufacturing conditions can be met with in different districts. A remark was made at last Conference that in New Zealand official control of dairying was vested in one authority, and the inference was that it would be good for Australia if the same applied here. The speaker was oblivious of the fact that New Zealand could be located inside the boundaries of New South Wales, which, compared with Queensland, Western Australia, and South Australia, is a small State.

While unified control is doubtless the thing for the small Dominion or State, decentralisation of control is needed in the case of continents. That is why, under the scheme for dairy organisation in Australia, we have striven for (*a*) district control, linked up to (*b*) State control, which in turn would be connected up by the Australian Dairy Council with the full scheme.

Starting in the north: Queensland had a good spring in some parts, but generally speaking it experienced an adverse year, and production was lowered through lack of feed for the stock. The North Coast of New South Wales was also badly affected in the same way; and the shortage of water for stock purposes, and also for washing dirty utensils and the butter in the churns, affected the quality of the milk, cream, butter, and cheese. Partially dried up reservoirs, dams, swamps, lagoons, and streams became sources of contamination, owing to cows wading into them and covering the lower parts of their bodies with mud and slime containing millions of injurious putrefactive micro-organisms. The Hunter River Valley, the Northern Tablelands, South Coast, and Riverina districts had much better conditions, while in the southern State of Victoria the dairy-farmers had a splendid season, their production being greatly above the average. The surplus in Victoria had a marked effect in lowering the prices for butter and cheese on the New South Wales local market.

Conditions in Other Countries.

In Denmark, in spite of naturally harsh climatic conditions, production of butter materially increased. Siberia also progressed in the same direction, and New Zealand had a good season, the surplus available for export

* The first portion of this paper was read at the Conference of N.S.W. Co-operative Butter and Cheese Factory Managers and Secretaries, Sydney, June, 1924.

being above the average. In the Argentine, the rapid expansion of recent years continued, as is shown by the fact that the production of butter for the year 1911 was 1,395 tons, while for the year 1922 it was 24,483 tons; for the year 1923-24 the figure will be over 30,000 tons. The exports to England for January, 1924, equalled 4,687 tons of butter, and in February 4,036 tons were sent away. Thus in two months the Argentine sent overseas more butter than New South Wales had despatched in the last two years.

In the United States of North America production has increased, but is still not sufficient to meet consumption—quantities being imported from Denmark, Holland, France, the Argentine, and New Zealand. These increasing importations plus the increased production have caused a weakened market both in England and the United States. In the former market, where we principally send our surplus, prices were considerably lowered—became so low, in fact, that export parity could not be accepted if our dairy-farmers were to make production costs. As production in Siberia, Argentine, and other centres will go on increasing, the tendency is for still lower values to prevail.

From these outside causes, therefore, has arisen the great desire of the dairy-farmer to stabilise or regulate the price within Australia; and having done that to increase our population by fostering secondary or manufacturing industries, so that by increased consumption within Australia, not only may the present exportable surplus be absorbed, but any increase in production could be sold to consumers in Australia whose high standard of living and wage receipts permit them to pay a price for dairy products that will enable the farmer in his turn to make a decent living from his holding.

Conditions in New South Wales affecting Production.

We can now better understand what has transpired in New South Wales. Although the sigificance of the slogan "increase production" has been understood, the adverse season which prevailed in our best dairying centre (North Coast) prevented its realisation. The class of dairy cows that in 1921-22 gave 95,000,000 lb. butter could last year only produce 65,000,000 lb Owing to the bad season and shortage of pasture and other fodder, the dairy-farmer was £2,000,000 behind in his receipts for the twelve months. This means a lessened ability to buy better bulls, and to go in for better systems of breeding, selection, and fodder conservation. Further, cows that should be in calf and due to freshen next spring will in many hundreds of cases remain dry—a state of affairs which can also be attributed to the adverse seasons of the last two years.

There are many things that might be done to help the farmer to assist himself, but these all take money, and owing to the lessened production of the herds during the last two years, and the greatly lowered prices ruling both locally and overseas for dairy products, it follows that further delay will occur before remedial measures can be brought to a successful issue. It would seem that the better way to carry out such measures as are required to bring about better feeding (including conservation of fodder) and better

breeding (including testing and culling), would be by the community co-operative system, aided by the provisions of the Co-operation, Community Settlement, and Credit Act. The present land tenure system in relation to tenant farmers needs special attention, in order that inducements and safeguards may be given to these dairy-farmers to encourage them to grow and conserve fodder crops, to procure better dairy bulls, and in general to build up higher producing herds.

Another matter that should be faced is inflated land values. During the boom period, when butter went to 2s. 6d. per lb. and over, the price of land doubled, and in some cases more than doubled. There is only one sound basis on which farm land can be valued—the nett return per acre received from it. In dairying this is shown in the milk and cream cheques. Double the yield of butter-fat per acre without greatly increasing cost of production (either by improving the yield per cow or by doubling the carrying capacity of the land), and it follows the real value of the land is likewise increased. Owing to the poor seasons experienced since the boom, it is almost ruinous for those farmers now to face a reduction in land values or to cut their losses as was done by commercial houses.

The greater the delay in commencing the reformation needed, the harder it will be to carry it out, on account of the rapidly increasing surpluses of dairy produce in other countries competing with us, and the falling prices, while the cost of working the farm does not decrease.

Matters that affect Quality.

Mention has already been made herein of the effect on quality (as well as quantity) of the adverse season experienced. Another factor bearing on this is ill-equipped, badly-constructed factories. These are all being brought up to the requisite standard as quickly as possible; twenty-five factories have been rebuilt entirely, and in most cases partially re-equipped; seven others are now being rebuilt, and orders have been given in regard to fifty-three. Of these last, some will need to be rebuilt entirely, while others can attain the required standard by renovations. Apart from the twenty-five new factories already completed, a number have met the inspectors' requirements by minor or major alterations and additions. The money already spent in this direction now amounts to over £250,000, and new premises now under construction are costing about £75,000.

The result of this work has become apparent in the improvement in quality, and in the reduction in working expenses connected with the manufacture of both butter and cheese.

Competition for Supplies of Cream.

The strong competition among co-operative factories operating in the one zone has been and continues to be, in spite of the cream-grading clauses of the Dairy Industry Act, an important cause of inferior milk, cream, butter, and cheese. This can best be remedied by having one company for each zone; and further, in order to obtain all the benefits arising from being able to put large quantities on the market under one brand, manufacturing

zones should be grouped so as to have one brand between them. If this was done, an efficient system would have to be put in force whereby the quality of the output from each factory would be standardised, as has been done by the North Coast Company, Byron Bay.

Selling Inferior Butter and Cheese at Top Rates.

The system practised in Sydney and London of selling inferior dairy produce at highest market rates ruling for choicest, or giving an average price for several grades, cannot be too strongly condemned. It is harmful to both producer and consumer. It has been the greatest difficulty we have had to combat during the past six years in our endeavours to uplift quality. The magnificent progress made in this direction has been effected in spite of the continuation of such dishonest trading methods. In connection with the local market, the result is now coming home to some distributors and manufacturers. A big manufacturing company, by guaranteeing uniform high quality and full supplies all the year round, has captured more than its share of the local market. The local trade is worth now £40 a ton above London values for butter. Therefore, those who cannot sell locally must export at a loss, which means a big handicap in retaining their cream suppliers.

The action of one large company in establishing its own selling floor in Sydney, Newcastle, and elsewhere, has been the most important commercial change effected during the year. One satisfactory outcome will be an uplift in quality for the local trade, as no factory can afford to lose this market. It will also tend to bring about greater concentration of manufacture, and a realisation of the sound business principle of grouping the different companies operating in the same district. It will also force the marketing of our produce under fewer brands. At the present time there must be some 300 brands for choicest butter in this State. By grouping and standardising, they could be reduced to not more than ten, and possibly less. This alone would have a material effect in stabilising the commercial or distributing end of the industry.

The demand for a price to cover cost of production must in fairness include a demand of price for quality.

Winter Requirements.

Winter production is, as usual, much below the level of the local consumption, and the shortage is usually made up by storing and carrying forward some of the extra choicest of the summer surplus, and by importations from other States and from New Zealand. The latter source of supply was largely availed of last July and August.

If the suggestion of "one brand one group" was given effect to, each such group would be able to do what the company referred to has done, viz., contract with its grocers to supply them full quantities, both winter and summer, the summer surplus being held by the factories in cold store for their customers' requirements in winter. The grocers, being on yearly contracts and guaranteed both quality and full supplies, would not then

need to import inferior butter from sources outside this State each winter. This, again, would be of assistance in stabilising and safeguarding the New South Wales market for our own factories.

Placing Australian Butter before the English Consumer.

The complaint is rightly made that Australian butter does not come before the English customer as Australian. This might be gradually and increasingly met by forwarding butter in 1 lb. and ½ lb. prints instead of in 56 lb. bulk packages. The Eastern trade is supplied with prints ready to be handed out by the retailer to the consumer, with the Australian markings on the print wrapper. Butter for this trade is regularly cold-stored for months; that is, the winter consignments are filled by butter printed and stored during the summer months. Frozen bulk butter must be thawed out before it can be cut up into 1 lb. blocks. It is much better to cut it up before freezing and then freeze the boxes of prints. There need be no fear that butter in 1 lb. prints would not keep over lengthy periods of storage. The English grocer in the poorer quarters frequently sells 1 oz. or 2 oz. of butter. The 1 lb. prints could be marked in 1 oz. sections on the wrappers at each edge, and the grocer would then only have to cut these off with a wire to meet the wants of each customer. Surplus small squares of butter paper, say, 100 in each box, could be sent to England for pressing over the ends of each such section as it was cut off. These squares could each bear the factory's brand, the quality of the butter, the name of the State of origin, and the word Australia.

In this way butter would get to every householder in a package carrying full particulars as to origin, &c. Of course, large trading companies, especially those with multiple shops, would not be favourable, as they would desire to use their own trade marks or brands as in the past, but the smaller trader should be only too glad to be saved the expense of providing wraps, and also the labour and loss of cutting up.

If we could only make a beginning in placing our butter as Australian before some consumers it would be a great gain and advertisement, especially as our butter compares so well with that of our competitors.

Dimensions of the Local Market.

The New South Wales public consume more butter per head than any other people in the world. The consumption per week of each of the Australian States is approximately as follows:—

New South Wales...	... ...	22,000 boxes (56 lb. each).
Victoria ...	... ...	15,000 ,, ,, ,,
Queensland	... ...	6,000 ,, ,, ,,
South Australia	... ...	2,500 ,, ,, ,,
West Australia	... ...	2,000 ,, ,, ,,
Tasmania ...	... ...	1,000 ,, ,, ,,

It has also to be borne in mind that the New South Wales public looks for, and generally gets, the highest grade; and is aided in this by the constant check kept by State graders on the various brands placed on the

market, in order to ensure that the actual quality is truly described on each box. In other States this is not done.

The proportions of New South Wales dairy produce disposed of locally are interesting:—

Cheese.—Practically all the cheese manufactured is consumed within the State.

Condensed Milk.—By far the greater proportion of the condensed milk is exported overseas.

Whole Milk.—Eight per cent. of the milk yielded by the herds in New South Wales is consumed as whole milk by the people of the State.

Butter.—The major portion of the milk given by the dairy herds in this State is used for the manufacture of butter.

The percentages used in connection with various milk products will vary according to increases or decreases in production. On an average they are as follows:—

Butter	73 per cent.,	equal to production of	570,000 cows.
Cheese	3 ,,	,, ,,	23,000 ,,
Whole milk trade ..	8 ,,	,, ,,	61,000 ,,
For other purposes.	16 ,,	,, ,,	121,000 ,,
		Total	775,000 ,,

It will be seen, therefore, that the disposal of the quantities of butter manufactured is of more importance than that of all the other sections combined.

During the past twelve months butter production in factories has been as follows:—

July, 1923	2,501,809 lb.	February, 1924 ...	8,775,135 lb.	
August ,, ...	2,524,631 ,,	March ,, .	8,881,712 ,,	
September ,, ...	3,634,173 ,,	April ,, ...	7,081,383 ,,	
October ,, ...	6,390,925 ,,	May ,, ...	5,000,000 ,,	(estimated).
November ,, ...	5,937,792 ,,	June ,, ...	4,000,000 ,,	,,
December ,, ...	5,145,419 ,,			
January, 1924 .	8,107,469 ,,	Approx. Total	68,000,000 ,,	

It will be noted that the spring increase was checked in November, and a further decrease occurred in December. After Christmas, when rain broke the drought period, an increase took place, but the totals for January, February, and March were much below those for the year 1922—the cows were too low in condition to respond to the better feeding conditions that prevailed after December. Of the 68,000,000 lb produced, approximately 85 per cent., or 58,000,000 lb., was disposed of locally, and only 15 per cent., or 10,000,000, was exported overseas. That is, the ratio of our production sold for the local trade to export trade was as 6 is to 1, or, in other words, for every box of butter sent overseas six were disposed of on the local market. This emphasises the increasing value of the local market. If the whole of the butter produced had been of choicest grade there need not have been any export surplus (provided there were no imports from other States), as production for the past year did not exceed the State's consumption capacity by more than 8,000,000 lb., and this would have been used in the interstate trade. As it was, New South Wales had to relinquish most of its

normal Western Australian trade of over 1,000 boxes of choicest butter per week in favour of Victoria, because we had not the available surplus after supplying our own local requirements.

The following table shows approximately how the whole of the butter produced in New South Wales, plus that imported from New Zealand, Victoria, and Queensland, was disposed of. The export figures for July, first half of August, 1923, and the last week of June, 1924, have been estimated. as actual figures for those periods are not available in this office. However, it can be taken that the total export amounted to about 4,500 tons

Month.	Exported. (a)	Estimated Local Trade. Choicest Quality. (b)	Estimated Stored for Winter Supplies. Choicest Quality. (c)	Total New South Wales Production (d)	Imported from N.Z., Victoria and Queensland. Estimated. (e)	Butter stored previous to 30/6/23. Estimated. (f)
	lb.	lb.	lb.	lb.	lb.	lb.
*July	178,318	5,250,000	....	2,501,809	....	....
*August	311,640	5,250,000	....	2,524,631	....	....
September ...	205,884	5,250,000	....	3,634,173	....	....
October ...	451,300	5,250,000	....	6,390,925	....	....
November ...	1,157,222	5,250,000	....	5,937,792	....	....
December ...	682,072	5,250,000	56,000	5,145,419	....	....
January ...	1,586,368	5,250,000	112,000	8,107,469	....	....
February ...	2,553,880	5,250,000	168,000	8,775,135	....	....
March	1,982,680	5,250,000	112,000	8,881,712	....	....
April	623,968	5,250,000	....	7,081,383	....	....
May	273,784	5,250,000	....	5,000,000*	....	....
*June	172,904	5,250,000	....	4,000,000	....	....
TOTAL ...	10,080,000	63,000,000†	3,976,000	68,000,000	6,000,000†	3,000,000

* Estimated.

† Official figures regarding imports, made available since the table was compiled, show that actually some 10,000,000 lb. butter were imported instead of the 6,000,000 lb. shown. The later figures also show that the actual quantity consumed in New South Wales was somewhat over 65,000,000 lb. instead of the 63,000,000 lb. shown.

For the purposes of this table local trade has been put down at approximately 21,600 boxes a week, which is under the Statistician's estimate, now confirmed, of 29 lb. per annum per head of population.

The quantities imported during July, August, and September, 1923, and in April, May, and June, 1924, have been estimated at 6,000,000 lb., which amount, when added to the estimated New South Wales total production (68,000,000 lb., plus the quantity of butter stored previous to 30th June, 1923, and disposed of on local market during July, August, and September —estimated at about 54,000 boxes) will balance the quantities marketed overseas, locally, and stored for use during July, August, and September, 1924.

The quantities given in columns (*a*), (*b*), and (*d*) of the table can be taken as correct, or approximately correct. The estimates in the columns (*c*), (*e*), and (*f*) are only rough approximations.

(To be continued.)

Mount Russell Maize-growing Competition.

MARK REYNOLDS, Senior Agricultural Instructor.

During the past season Mount Russell Branch of the Agricultural Bureau conducted a maize-growing competition amongst its members, to ascertain the most suitable variety and the best yielding strain of any variety. Added interest was given to the competition by the Department supplying for comparison a number of standard varieties considered suited to the district.

Mr. R. A. Warden, the hon. secretary of the branch, supplied the land, and carried out the cultural operations in a satisfactory manner, maintaining a weed-free mulch. The trial was situated on red loamy soil of good fertility. The previous crop was wheat in 1922, harvested for grain. No fertiliser had been added to the soil at any time.

In preparation for the trial the land was ploughed in August about 5 inches deep. Prior to seeding, it was disc-cultivated and harrowed. Sowing was carried out on 13th October, the seeds being dropped three together, approximately 3 feet apart, in drills spaced about 4 feet 6 inches apart. Subsequently the land was harrowed, and later two inter-row cultivations were given.

The rainfall during the growing period was as follows:—October, 279 points; November, 5; December, 331; January, 125; February, 555; March, 67; total, 1,362 points. It was deficient from 1st November to 23rd December. Early Morn had matured beyond tasselling before the break of the dry spell on 23rd December.

Competitor.	Variety.	Yield per acre. bus.	lb.	Remarks on Seed sown.
Department of Agriculture.	Kennedy	38	48	
F. Maher	White Prairie Queen	36	53	Mostly Silvermine type.
S. Fox	Yellow Mastodon	3?	18	Yellow Mastodon type: fairly good seed.
Department of Agriculture.	Iowa Silvermine	35	0	
Department of Agriculture.	King of the Earlies	33	28	
R. A. Warden	Funk's Yellow Dent	33	17	Fairly good type; seed not plump.
Department of Agriculure.	Mastodon White Cap	33	11	
Department of Agriculture.	Auburn Vale Hogan	32	7	
S. Fox	Goldmine	29	45	Fairly good type; not plump.
A. E. Costi	Funk's Yellow Dent	29	42	Good type and good seed.
H. Cameron	Brewer's Yellow Dent	28	27	A rough dent, selection of Funk's.
R. Benekes	Golden Superb	28	5	Not very pure, but good quality seed.
Department of Agriculture.	Eureka	27	47	
Department of Agriculture.	Golden Glow	24	39	
A. McClymont	Early Morn	20	20	Good type; not very plump seed.

The quality of the grain and freedom from disease was in each instance satisfactory. Fox's No. 1 showed the highest percentage of grain to core.

Cotton Trials in the Parkes District.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

In 1923 the Parkes Chamber of Commerce co-operated with interested parties in testing the suitability of the Parkes district for the production of cotton.

In the early part of the season—August to October—a representative of the British-Australian Cotton Association visited the district, locating suitable soils, and instructing farmers as to the cultural methods required by the crop. Unfortunately, the association withdrew their representative in October; but the tuition of growers was ably carried on by Mr. G. Garling, a member of the Chamber of Commerce.

A fairly large parcel of seed was distributed to numerous growers, and was sown with very varying results, the most successful being the trials conducted by Mr. H. Davis, of Billabong Creek, and Mr. A. Head, Kurrajong, Parkes.

Mr. Davis planted an area of approximately one-thirteenth of an acre, from which he picked 75 lb. clean cotton, representing 982 lb. per acre, and 64 lb. stained cotton, representing 838 lb. per acre, making a total yield of 1,820 lb. of seed cotton per acre. The plot was very favourably situated in a bend of the Billabong Creek, the soil of which is deep, rich alluvial, and very limited in area. The seed-bed was well prepared in the winter, and the seed sown by hand in drills 5 feet apart on 8th September, 1923. After a satisfactory germination, the crop made splendid growth to a height of 4½ feet, which gave an excellent setting of bolls. By dusting the plants with lime and ashes the pests were kept under control, and by constant and careful cultivation a check to the crop growth was avoided during somewhat dry conditions.

A cool summer delayed the bursting of the bolls, and when light frosts occurred during April only portion of the crop was harvested. Although the light early frosts retarded the opening of the bolls, the later severe frosts of May partially opened most of the remaining bolls, which made it possible, by using both hands, to pick a considerable amount of slightly-stained cotton.

Mr. A. Head planted an area of approximately three-quarters of an acre, from which he picked 168 lb. of clean cotton, representing 228 lb. per acre, and 171 lb. of stained cotton, representing 232 lb. per acre, making a total yield of 460 lb. of seed cotton per acre.

The plot was grown on soil of a light red loam character, 9 to 24 inches in depth, and representative of a type fairly common in the district. It was mouldboard ploughed 7 inches deep in August, 1923; harrowed twice in August; scuffled on 21st September, and again on 19th October. Sowing commenced on 22nd October, 1923, and was completed by 12th November.

The seed was sown by hand in rows 3½ feet apart. During growth, cultivations were as under:—Scuffled between the rows on 12th November, again on 31st December, and on 24th January. Plants were thinned out and hilled on 27th and 28th December.

The first squares were showing on 4th January, and by 12th January there were many flowers. Picking commenced on 18th February, and was continued till the middle of July. A small late sowing was made on 24th December, but, though the plants made good growth, the setting of bolls was poor.

The Season.

The effective rainfall was as follows:—

1923.		1924.	
July ...	... 346 points.	January ...	... 70 points.
August ...	... 92 ,,	February	... 307 ,,
September	... 133 ,,	March ...	.. Nil.
October ...	... 245 ,,	April ...	... 246 ,,
November	... 254 ,,	May ...	... 66 ,,
December...	... 83 ,,	June ...	... ...

The months of September and October were dry and unfavourable for germination, which in many cases did not take place till after the rains late in October. Patchy germination was consequently common, and a number of re-sowings were made. From 5th November till the middle of February—the period of growth—rains were light and of little use. February was more favourable. The summer was marked by unusually cool weather, and this being associated with dry conditions, made for late development and maturity of the plants.

"Outlines of Fungi and Plant Diseases."

The fungi form a large and important class of the vegetable kingdom, some of these organisms being of such every-day occurrence that they must be familiar to everyone. The moulds and mildews that form on bread, cheese, jam, wood, decaying leaves, &c., do not, however, occasion the serious losses that farmers have learned to associate with rust and bunt on wheat, with blight on potatoes, with black spot on grapes, with peach leaf curl, with armillaria, and many others. Happily a good deal of information is now reaching the farmer and fruit-grower as to troubles of this kind, and with it some appreciation of the steps that may be taken to control them. The little work before us, by F. T. Bennett, of Leeds University staff, is intended for both students and practitioners of agriculture and horticulture. It devotes some sixty-seven pages to a general description of fungi. their methods of reproduction, and the main classes into which they may be divided. Certain types of fungi are then chosen to illustrate the great orders and their classes, and these are subsequently taken up as the points round which the fungi that cause common plant diseases are grouped in the second part of the work. The control aspect is covered somewhat briefly and generally at the end, but is also dealt with in the course of the matter. The Australian reader will value the book chiefly for its clear and accessible discussion of a subject that is really very complex.

Our copy from the publishers, Macmillan and Co., Ltd., London.

Temperature of the Cheese Curing Room.

T. H. ATKINSON, N.D.D., Senior Dairy Instructor.*

THE advantage of a low temperature in the curing of cheese is common knowledge with cheesemakers and factory managers, but few realise the tremendous losses of cheese which occur at our factories from year to year through faulty construction and failure to control the temperature of the cheese curing room.

Much data has been published on the subject, but little local information is available. In order to show the effect of temperature on the yield of cheese under our own conditions a small experiment was recently conducted by the Dairy Branch in co-operation with the manager of the Moruya cheese factory.

The experiment was a follows:—Two batches of eight cheese were selected, one batch being made from pasteurised milk, and the other from non-pasteurised milk. Each batch was divided into two lots of four cheese, which were weighed and marked for identification.

Batch A was made from pasteurised milk on 22nd. February. Lots A1 and A2 were weighed on 29th February, and turned the scale at 57 lb. for each lot of four cheese.

Batch B was made from unpasteurised milk on 24th. February. Lots B1 and B2 of four cheese also weighed on 29th February, each scaled 58½ lb.

Lots A1 and B1 remained in the factory curing room until 1st May, when they were shipped with the ordinary consignments to the selling agents in Sydney. They were weighed on 5th May, 1924. During the period of curing the temperature varied between 63 deg. Fah., and 72 deg. Fah., with a mean average of 67 deg. Any loss of weight was due to moisture evaporation, as there was no exudation of fat.

Lots A2 and B2 were shipped with the ordinary consignment of cheese on 1st March, and were placed in cold store when they arrived in Sydney three days later. They were withdrawn from cold store and weighed on 7th May. During this period the cheese were under an average temperature of 42 deg. Fah.

All the cheese were subject to similar conditions, except for the variation as stated. It will be noted that the cheese for cold store did their travelling at the commencement of the period, when the weather was warmer, and also when they were in the earlier stages of their curing and more likely to lose weight quickly by excessive evaporation. But for this, no doubt the

* Paper read at Conference of the N.S.W. Co-operative Butter and Cheese Factory Managers' and Secretaries' Association, Sydney, June, 1924.

margin would have been greater in favour of the cold-cured cheese. Unfortunately we were unable to arrange suitable conditions closer to the factory.

The Saving of Cheese.

The following tabulation shows clearly the saving in cheese due to a reduction in temperature of 25 deg. Fah. :—

Batch.	Lot.	How Stored.	Temperature. Deg. Fah.	Period.	First Weighing.	Last Weighing.	Loss during the period.	Weight retained by cooling.
					lb.	lb.	lb.	lb.
A. Pastured milk ..	A1	Factory curing room	67 {Max. 72 / Min. 63}	9 weeks	57	55	2	
	A2	Cold store	42	,, ,,	57	56¼	¾	1¼
B. Raw milk . .	B1	Factory curing room	67	,, ,,	58½	56	2½	
	B2	Cold store	42	,, ,,	58½	57½	1	1½

The loss in weight under curing-room condition s was 2 lb. in the case of the pasteurised milk cheese and 2½ lb. for the raw milk product, whilst in the cold room the loss was ¾ lb. and 1 lb. respectively. The difference between the losses in each batch was in favour of cold storing to the extent of 1¼ lb. and 1½ lb., showing a total saving of 2¾ lb. on 115½ lb. of cheese.

The average gain, due to a reduction of 25 deg. Fah. at a much lower maximum temperature than is usually reached during the summer time in the curing rooms of most of our factories, is very striking. It actually means a saving in cheese of 2·4 per cent., or the retention of 2⅖ lb. of saleable cheese for every 100 lb. stored.

A factory with a maximum summer output of 2,000 gallons would probably be holding in its curing room 250,000 lb. of cheese for a period of one month to six weeks during the six summer months. Assuming that only 2 lb. per 100 lb. of cheese were saved by curing over the shorter period, the saving would amount to some 5,000 lb. of cheese in six months, which, at 9d. per lb. for cheese, is equal to £188.

In confirmation of these results, I might quote some New Zealand figures bearing on the subject which were published in the New Zealand *Dairyman* as results obtained at the Tatuanui factory :—

836 lb. cheese, cured at 68-70 deg. Fah. lost 26 lb. in 14 days.
837 lb. cheese, cured at 50-40 deg. Fah. lost 11 lb. in 14 days.

This shows a saving of 1½ lb. per 80 lb. cheese, or 1·8 per cent. in fourteen days.

These results were obtained with export-size cheese of 80 lb. weight. Our experiment was conducted with loaf cheese of 14 lb. weight.

Van Slyke, in New York Experiment Station Bulletin, No. 234, gives the following table, showing the variation of losses in weight of cheddar cheese while curing, due to the size of cheese and temperature of the curing room:—

Weight of cheese.	Weight lost per 100 lb. of cheese in 20 weeks at—		
	40 deg. Fah.	50 deg. Fah.	60 deg. Fah.
lb.			
70	2·5	2·4	4·2
45	2·7	3·7	5·1
35	3·9	5·9	8·5
12½	4·6	8·1	12·0

The evaporation of moisture is greater as the size of the cheese decreases and as the temperature is increased. This is probably due to the fact that a greater surface per pound of cheese is exposed in the case of the smaller sized cheese. The evaporation increases with an increase of temperature, probably because of the lowered relative humidity. Cheeses of higher moisture content usually lose moisture more rapidly.

A Word as to Quality.

The temperature of the curing room has a material effect on the quality of the cheese. The higher the temperature the more rapid is the curing. In the case of excess temperature, however, the cheese will lose not only excessive quantities of moisture but much fat. This waste is quite common in our cheese factories during the summer months, when the largest quantities are being made and stored. The melting of the fat (to say nothing of the loss in yield due to this cause) is distinctly detrimental to the quality of the cheese, spoiling the texture and body and producing an off flavour, due to the melted fat. Cheese subjected to this treatment does not keep.

On the other hand, too low a temperature checks the action of rennet and other ferments responsible for the change in the condition of the indigestible curd to that soft, mellow digestible condition of well matured cheese, and there is a tendency to the production of bitterness at very low temperatures. Cheese kept at low temperatures cure more slowly and develop a milder flavour, whilst those at higher temperatures cure faster and develop undesirable flavours. At the higher temperatures the undesirable organisms appear to be more active.

The use of low temperatures during curing is one of the surest methods of limiting the activity of gas-forming bacteria in raw-milk cheese.*

The Temperature of the Curing Room.

The most suitable temperature ranges between 40 deg. and 60 deg. Fah., according to the time of the year and the purpose for which the cheese stored is intended. Cheese made for quick sále on the local market is of weaker

*"Relationship of Bacteria to the Quality of the Cheddar Cheese." J. K. Murray, *Agricultural Gazette*, December, 1922.

body and contains more moisture than that intended for export. It cures more rapidly than well made cheddar cheese at any given temperature, but also decomposes quickly under our hot summer conditions. This type of cheese is profitable in the winter time, when owing to the lower temperatures it cures and carries well. For export purposes and for the summer trade a well made cheddar cheese is most desirable. Cheese of this type is capable of being stored for long periods without deterioration. It is also significant that cheese ripened at such low temperatures as are favourable to diminishing the loss of moisture can carry larger amounts of moisture from the start without impairing the quality. To try to meet the losses due to evaporation in hot curing rooms by the retention of larger amounts of moisture in the cheese during the process of manufacture is to court disaster.

Generally speaking, the lower the temperature the better the quality of the cheese over any length of time and the greater the saving in weight.

The Construction of the Curing Room.

Many of our cheese curing rooms are incapable of any sort of control, while others are but poorly insulated and hard to ventilate. One or two have been effectively controlled by means of sub-earth ducts and a few by means of artificial refrigeration.

The only efficient method of control is the last, but in the case of small cheese factories the installation is too costly. However, the utilisation of the lower night temperatures is within the reach of everybody. By so constructing the curing room as to have it capable of thorough ventilation, yet well insulated, a reasonably cool room may be secured during the greater part of the year in most districts.

In addition, an organised system of cold stores at the principal local ports or centres, linked with a central cold store at the centre of distribution or the port of export, as outlined by Mr. L. T. MacInnes, Dairy Expert, should reasonably fulfil all the requirements of our cheese factories at a minimum of cost, and at the same time save the huge losses, both in quality and yield, which obtain from year to year through our neglect to recognise the importance of temperature in the curing of cheese.

Moreover, the possibility of being able to hold a less perishable and consequently more stable article of better commercial quality at the factory, would allow the producer to take advantage of the best possible market. At the same time there would be a tendency to increase the demand on account of a more palatable and tasty cheese.

In hot, sunny weather, sheep should be provided with shelter while drying after dipping. It is possible to dip safely in quite cold weather, providing the sheep can be sheltered and protected during the rest of the day and the following night.

Contagious Pneumonia of Pigs.

W. L. HINDMARSH, M.R.C.V.S., B.V.Sc., D.V.H.,
Government Veterinary Surgeon.

CONTAGIOUS pneumonia has caused, for the past few years, the greater part of the mortality that has occurred among young pigs. In many districts it has been found on investigation that the majority of the piggeries are affected in some degree with this disease. When it is borne in mind that the condition is largely preventable, it is to be regretted that so many pig-owners treat the disease lightly, and only ask for aid and advice when severe losses have occurred.

This disease is scheduled as a contagious disease under the Stock Diseases Act, and it is incumbent upon the owner to notify the district Inspector of Stock when an outbreak occurs among his stock.

Contagious pneumonia is an inflammation of the lungs due to their invasion by bacteria. A number of different organisms have been found associated with the condition, and it is not possible to state that any one bacterium is the specific cause. It is probable that bacteria normally present in the lungs are enabled to produce the disease by lowering resistance of the animal body. Although the inflammatory changes are actually due to bacterial action, numerous predisposing causes operate to lower the body resistance and enable the bacteria to exert their pathogenic effects. All these causes can be grouped under the heading of unhygienic and insanitary management, and include—

(*a*) pig sties and yards in damp low-lying situations;
(*b*) inadequate housing and shelter;
(*c*) bad flooring in the sties;
(*d*) exposure to inclement weather;
(*e*) muddy, undrained yards.

Symptoms.

The earliest symptoms to be noticed may not be very definite, the affected pigs being indisposed to eat and inclined to lie about in sheltered corners. Some may be heard to cough, especially if chased about the yard. If the temperature is taken it will be found to have risen to 106 degrees Fah. or more. The following day some animals will be seen to be very ill, and, in acute cases, death may occur the same day. In most cases the course of the disease is more prolonged. Respiration becomes very rapid and shallow, a condition commonly referred to by the farmer as "pants." As the disease progresses the cough becomes more marked and a sticky discharge runs from the nose and eyes. This discharge dries and forms encrustations about the nostrils and eyes, and may partially glue the eyelids together. Meanwhile, owing to the feverish condition and lack of appetite the pigs lose condition rapidly. The animals may die within a week to ten days of the first onset of symptoms.

Very often, associated with this pneumonia, there occurs a skin eruption. Red patches appear and later become covered with rough, dirty scabs. These scabby areas are most common about the head and the back of the ears, but are also found in any part of the body.

In many cases the pigs make a partial recovery, and, with the return of appetite and the abatement of severe symptoms, may begin to regain condition. In other cases where death does not ensue, the animals remain stunted and fail to grow fat. Often such pigs are affected with nervous disorders characterised by partial paralysis and inco-ordination of movement, which result in difficulty of progression and loss of the senses of direction and balance. In cases of apparent recovery, the animals are liable to cough and show the rapid breathing characteristic of lung diseases, especially when exercised.

Pneumonia most frequently occurs in young pigs up to the age of four months. It is less common in pigs between the ages of four and seven months, and is comparatively rare in adult animals.

Post Mortem Examination.

On opening the chest cavity of a diseased pig, the lung will often be found adhering to the chest wall owing to the inflammation of the membrane covering the lungs. Even when actual adhesion has not taken place, the surface of the lungs and the corresponding inner surface of the chest is roughened and dull in colour.

The pneumonia is usually situated in the lower anterior part of the lungs To the feel, instead of being soft and spongy, the diseased lung is firm. On being cut, the colour is seen to vary from a dark red to a greyish colour, and may show a number of yellowish spots. Sometimes there may be a considerable area, up to a walnut or larger in size, which is filled with a dirty-looking, purulent material due to the breaking down of the lung tissue.

Control Measures.

No treatment of the sick animals is recommended, since it is not profitable to try and fatten pigs that have suffered from an attack of this disease. Recovered pigs are in most cases stunted in growth, slow to fatten, and affected with nervous disorders which prevent the animals from putting on condition. From an economic point of view it is better to destroy the affected pigs at once.

Prevention.—The following preventive measures are recommended:—

(*a*) All apparently healthy pigs should be removed at once from those showing signs of pneumonia.

(*b*) All sick pigs should be destroyed and the bodies burned.

(*c*) If the sties which housed the sick pigs are not of solid construction they should be burned where they stand. The yards should be dug up or ploughed and treated with lime and a green crop sown. Where the sties are well built and too valuable to be burned, they should be thoroughly disinfected by scorching all over with a brazing lamp, or thoroughly washed with

a 5 per cent. solution of disinfectant. The floors should be well scalded with boiling water and then treated with quick lime. Wooden feeding troughs should be burned. Concrete and iron troughs should be well disinfected with a 2 per cent. solution of washing soda in boiling water.

(*d*) Where practicable, a new piggery should be erected on a fresh site and care taken that only healthy pigs are introduced.

(*e*) All newly-purchased pigs should be isolated for a period of three weeks before being placed in the general piggery. All pigs noticed to cough frequently should be kept isolated and sold for slaughter as soon as fat.

(*f*) Care should be taken that the pig run is dry and well drained in wet weather. The pig sties should be warm and dry and free from draughts. The floor should be raised above the ground level, and if of concrete or brick, a wooden sleeping platform should be provided.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1924:—

Description.	Imports.	Exports.
Interstate.	Cases	Cases.
Fresh Fruit ..	761,813	92,792
Tomatoes ..	34,569	..
	doz.	doz.
Melons	....	155
	bush.	bush.
	......	259
	lb.	lb.
Canned Fruit ..	42,532	2,576
Dried Fruit—		
Unspecified ...	12,572	1,708
Currants	3,192	168
Raisins	2,548	140
Apricots .	644	98
Apples ...	1,624	...
Sultanas ...	308	...
Peaches ..	700	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Citrus	... .	1,765	1,482
Apples .	....	...	667
Pears	.. . ...	...	2,053
Pineapples ...	.. ..	...	1,736
Bananas ...	... .	160	...
Other	....	88	3,129
Dried Fruits—			
Apples, Pears,		lb.	lb.
Peaches, &c..	Japan	8	...
	U.S.A.	1,250	...
Apples ...	....	...	805
Apricots ...	.. . .	...	204
Currants .	.. ..	...	29,286
Prunes ...	France	15,343	847
	U.S.A.	11,363	...
Peaches ..	....	...	112
Raisins—			
Sultanas ...	United Kingdom	8	6,825
Lexias ...	. ...	...	56
Other ...	Spain	277	684
	U S.A.	2,900	...
Dates	Mesopotamia ...	8,641	206,400
Other	United Kingdom	186	1,785
	China	4,478	...
	France	1,324	...
	U.S.A.	4,677	...
	Egypt	2,680	...
	Persia	56	...
	Italy	2,947	...

Bureau Trials with Green Peas.

Field trials with green peas were carried out last season by two branches of the Agricultural Bureau—at Borenore and at Cargo Road, both in the Orange district.

The land devoted to the trial at the first-mentioned centre consisted of two types of soil—a light sandy and a heavy chocolate loam. The previous crop had been oats in 1921 and 1922, since when the land had been spelled. It was mouldboard-ploughed in August, 1923, harrowed in November, and again ploughed, rolled, and harrowed early in January. Seed was sown by hand 3 inches deep at the rate of 60 lb. per acre on 29th January, in furrows opened up by a single-furrow plough. Superphosphate was applied at the rate of 90 lb. per acre. On one-half of each plot the seed and superphosphate were applied together, and on the other superphosphate was drilled in afterwards.

The varieties under trial were Greenfeast, Stratagem, Witham Wonder, Daisy, English Dwarf Defiance, English Wonder, Improved American Wonder, and Richard Seddon. On all four plots Greenfeast gave the highest yield, Witham Wonder making the next best showing. The lateness of sowing, however, gave an advantage to the early-maturing varieties. In the opinion of members Greenfeast was the best variety for commercial purposes, and Stratagem the best for home use, the flavour of the latter being voted much superior, and the finest of the varieties tried.

The application of seed and superphosphate together resulted in appreciably bigger yields than subsequent drilling in of the fertiliser on both types of soil.

The trials at Cargo Road were carried out on red loam land, the previous crop on which had been rye, ploughed under in a green state during August. It was afterwards harrowed twice and cultivated once, seed of seven varieties being sown on 14th December, 1923, at the rate of 1 bushel per acre, with superphosphate at the rate of 1¾ cwt. per acre. Germination generally was good, but growth was variable. Harvesting took place late in February and early in March, with the following averages per row:—Greenfeast, 211 lb.; Witham Wonder, 175 lb.; American Wonder, 171 lb.; English Wonder, 127 lb.; Sherwood, 109 lb.; Richard Seddon, 98 lb.; Dwarf Defiance, 69 lb. There were three pickings of Greenfeast and two of the other varieties, except Dwarf Defiance, of which there was only one.

It will be noted that, with an earlier sowing, Greenfeast and Witham Wonder again occupied first and second places respectively.

Potash from Sunflowers.

In spite of crop failures and famine at home, Russia has within the past two years been exporting considerable quantities of potash. The Russian product is extracted from the rich soils of south-eastern Russia by burning the stalks of sunflowers, which are extensively grown there. Last year more than half a million acres were devoted to this purpose, the yield of potash being from 160 to 190 pounds to the acre. The Russian potash is purer than the German, which is mined from the earth, and, before the war, was successfully sold in Germany in competition with the local product.—*The American Fertiliser.*

Prolapse of the Vagina in Sheep.

In consequence of serious losses among a flock of lambing ewes this winter, Mr. A. L. Rose, B.V.Sc., visited a property on the South-western Slopes in July, and, after inspection, submitted a report which Mr. M. Henry, Chief Veterinary Surgeon, has made available for publication as touching a matter of considerable interest to stockowners. The report indicates conditions that are not altogether uncommon and that lead to considerable loss that could readily be prevented, and shows the value of veterinary advice even in such a matter as the care of ewes at lambing time. The following paragraphs are from Mr. Rose's report:—

The property consists of 1,700 acres of hilly country and river flats, and was carrying at the time 2,200 comeback ewes and 32 Romney Marsh rams. The rams were put with the ewes in November of last year, but did not take to the ewes till the early months of this year. The season was a good one, and everything was in favour of a successful lambing, with the exception that some of the ewes were fatter than is desirable.

It had been reported to the Department by the overseer that among the lambing ewes twelve had suffered from prolapse of the vagina, the fœtus being retained. Two post-mortems had been made, and the presentations were considered normal, and it was difficult to understand why the fœtus had been retained, in spite of the great straining that must have taken place on the part of the ewe to cause the vagina to become prolapsed. Upon inspection of the flock, enough material was found for four post-mortems, and, in addition, the opportunity presented itself of examining three ewes having difficulty in parturition. The following details were observed in these cases:—

No. 1.—This ewe had been dead some days, but was in a good state of preservation. The vagina was completely prolapsed, the vaginal opening of the cervical canal being visible from the exterior. On opening the uterus it was found that the head and left leg were in a normal position for presentation, but the right leg was flexed back at the carpus, the elbow being also flexed—a definite hindrance to parturition. Evidently the ewe had attempted parturition, but the faulty nature of the presentation had interfered with the further progress of the fœtus; labour had been maintained, with the result that the vagina became prolapsed, the amniotic fluids escaped, and the fœtus slipped back into the uterus.

No. 2.—This sheep had been dead some days. The vagina was prolapsed. On opening the uterus it was found that the fore-limbs were in the cervical canal, but the head was deviated back laterally. Successful parturition was obviously impossible without assistance, and the sequel was evidently the same as in the case of No. 1.

No. 3.—This sheep had evidently died overnight. The vagina was prolapsed and lacerated. The uterus was found empty, the lamb having been dropped. This was evidently another case of distocia, and, as it was unlikely that the ewe overcame the obstruction, it is probable that some assistance had been given.

No. 4.—This ewe was caught and examined, as it was seen that labour had commenced, the head of the fœtus being visible from the exterior and the lamb dead. This proved to be a case of distocia in which the head was presented but the fore-limbs were flexed at the elbows, the elbows being unable to pass over the pelvic brim. The distocia was reduced and the lamb delivered without further difficulty.

No. 5.—This sheep was caught, and an examination proved it to be a similar case to No. 4. The distocia was reduced and the lamb delivered.

No. 6.—This sheep had been dead some time, but was well preserved, having been put in a crow trap. The vagina was prolapsed and part of the body of the uterus also. On opening the uterus it was found that distocia had again been the causation factor. In this instance the fœtus was on its back, one hind leg was presented, the other being flexed back at the hock.

No. 7.—This sheep was seen to be in difficulty, and was caught and examined. The vagina was normal and empty. On introducing the hand, labour commenced vigorously, but the fœtus did not appear through the cervical canal. On passing the hand into the uterus, the tail and both hocks were found to be caught firmly below the brim of the pelvis. With this obstruction and the active labour on the part of the ewe, the vagina would in all probability have become prolapsed before long. The fœtus was repelled, the difficulty corrected, and delivery effected without further trouble.

As the result of these examinations it was concluded that the frequent occurrence of prolapse of the vagina was not extraordinary; rather was it a secondary and quite natural result of a definite obstruction to parturition due to faulty presentation of the fœtus.

A Remarkable Yield from Shiraz Grapes.

"The yield from Shiraz has been most extraordinary, 6½ acres returning at the rate of a little over 8 tons per acre, or 1,040 gallons of wine per acre."

The foregoing figures were quoted by Mr. L. Reymond, Champsaur Vineyard, Forbes. In South Australia, a white variety named Sercial, an exceptionally heavy cropper, occasionally bears as much as 8 tons to the acre, and at Watervale, in the Clare district, where good rains are experienced, yields of 4 tons are commonly obtained from Shiraz; but a 5-ton crop from Shiraz under non-irrigation conditions is regarded as remarkable. It was ascertained by subsequent correspondence from Mr. Reymond that some two-thirds of his area was flooded from the river in July and September, but the portion that was not flooded yielded almost as heavily as the flodoed area.—H. L. Manuel, Viticultural Expert.

By proclamation in the *Government Gazette* of 8th August, in pursuance of section 10 of the Stock Diseases Act, 1923, the Minister for Agriculture, the Hon. Frank A. Chaffey, declares all land embraced within the county of Cumberland to be a quarantine area on account of the suspected presence of swine fever, contagious pneumonia of swine, and necrotic enteritis.

Some Aspects of Food in Relation to Disease.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.

It is often remarked with regard to live-stock that half the breeding is in the feeding, and with equal truth it might be asserted that half the health is in the food. More than ever is this seen to be the case if one looks at the discoveries now being made of the value of certain little-understood constituents of various food materials known as vitamins. It is not intended, however, to go deeply into that subject here, but rather to consider what influence on the health of live-stock feed in general may exercise in one way or another. There is likely to be some tendency, following the recent discoveries, to regard the vitamins as being the only factor of value from a health-producing point of view, and it is necessary to remember that feed profoundly influences the health of live-stock in many other ways.

It is obvious, of course, that if an animal has not sufficient food it will suffer from weakness and starvation, and will ultimately die, but it is not always readily recognised that the factors of variety, palatability, digestibility, cleanliness, and freedom from various forms of contamination, may have far-reaching results as regards health. The composition of the food, and the relative amounts of the different food constituents, are also of importance, and last, but by no means least, the manner in which the food is provided.

It is by no means an uncommon occurrence, when reports of mortality are received, for the remark to be made that it is difficult to understand why the animals are dying, because there is plenty of feed. When the case is investigated, it is often found that, although there is a lot of what for want of a better term might be called food—matter with which hungry stock would fill themselves, just as in times of stress men have eaten shoe leather—regarded as in any sense true food, the stuff might almost as well not be there.

Looking at the question from another point of view, it is easy to see that many complaints among stock in which the stomach and bowels are involved are due to faulty feeding, but it is not so clearly understood that many diseases of the bones, lungs, eyes, nerves, and other parts of the body are just as intimately, though perhaps not so obviously, associated with the same factor. The more this subject is looked into, the wider its ramifications are seen to be. As an instance, it may be mentioned that rabbit destruction is quite closely linked up with disease in stock, and going back but one stage further, it will be found that the supply of wire-netting is a factor of considerable importance in preventing certain diseases of live-stock

which come under the heading of food in relation to disease, and this brings us to the group of complaints which includes bone-chewing, pica, and osteomalacia (bone-softening).

Bone-chewing in Cattle.

All up and down the coastal districts of New South Wales (and incidentally of Victoria and Queensland) are fairly large areas of country in which cattle develop the habit of chewing and eating bones. In some places nothing further of a striking nature happens, although there is and must be a falling off in efficiency in the animals, either of milk or beef production. In other places the animals suffer from great weakness of the bones, the calves are small and stunted, the animals themselves remain in poor condition even though there appears to be plenty of food, and mortality is high in anything approaching a dry season.

It has happened in the past, and it will happen again if steps are not taken to prevent it, that land which has at first carried stock without any symptoms of ill-health occurring—and bone-chewing is always a sign of ill-health—after a time fails to carry them so satisfactorily. At first, signs of bone-chewing appear; then as time goes on it becomes more marked, until eventually bone-softening with all its attendant evils is found to be present. It is all a question of the gradual exhaustion of the soil in certain mineral matters or of the soil getting into such a condition that the mineral matters present cannot be made available to the stock grazing over it. Naturally if to this exhaustion is added the effects of the rabbit, in the eating out of the best grasses and the hardening and consolidation of the soil, the progress of the disease will be far more rapid. That progress has been watched and followed in some of the districts of New South Wales by the Stock Branch of the Department.

There is a further development which has occurred in several instances in this State, and still more frequently in Tasmania. The habit of bone-chewing if very marked is apt to lead animals to eat the carcases of rabbits and other dead animals. These may be in process of decomposition, and there are certain organisms sometimes found in decomposing carcases which can cause sudden illness and fairly rapid death.

The whole of this series or chain of complaints will thus be seen to be based on the question of food. Cattle on good country obtain from the grass and herbage all the necessary materials to build up their bodies and supply milk —though even the richest country will deteriorate in time if everything is taken out and nothing put back If cattle are to be successfully grazed on the bone-chewing lands, what is lacking naturally must be supplied to them in the feed. The cattle may, in addition to the grazing, be fed on stuff grown on good country, such as lucerne and maize from the river flats, or on crops grown on manured lands, or they may be provided with a lick containing large quantities of bone-meal. Undoubtedly, the latter method is the more economical and the easier from the point of view of labour involved.

Anything which will increase the variety of the food and the quantity available will also be of value, as will the eradication of the rabbit from any particular holding.

It has often been noted that cases of the diseases mentioned are more numerous in the late winter and early spring. The reason is probably to be looked for in the fact that at that time there is often a large quantity of grass in a very dead and valueless condition. It is grass which has seeded and which has thus lost the greater part of its nourishment. What remains is practically straw. The supply of useful food constituents in such material is very low, and the cattle, already below par by reason of long feeding on bone-chewing lands, have no reserve strength to carry them over this dangerous period. It is at this time too that most cases of so-called "dry bible" and impaction paralysis occur. Both can be definitely prevented by some supply of extra nourishing food at this period.

These cases are all, in a way, due to a paralysis of the digestive organs, but it must not be thought that all cases of such paralysis occur as a result of innutritious food. It not uncommonly happens that cows which are fed continuously and entirely on finely-chaffed food and meals will also develop a paralysis of the digestive organs due to overloading. Much of this can be prevented by supplying cattle with a certain amount of "roughage," in the form of hay. Thus, if stall-fed cattle as their main ration get chaff, bran, and meal, the addition of a small quantity of lucerne hay would be of considerable value quite apart from its food value.

Except for the last instance, all the above types of illness are due to the want of certain elements in the food. They are conditions which are responsible for a very considerable animal loss in the State, and they are all preventible. The measures suggested as remedies are to supply bone-meal licks, to suppress rabbits, and to add some grown crop to the food available in the natural pastures.

Condition as a Factor in Resistance.

Would any other advantages from the disease point of view follow the adoption of these measures? It is hardly to be doubted, although such results might not be very obvious. In the first place, the offspring of cattle treated as suggested will be more vigorous than those of cattle not so aided, and vigour in youth means greater power of resistance to disease. Many bacterial diseases attack young cattle, and, with certain exceptions, it is the weak and sickly which suffer. It is suggested that tuberculosis is largely a disease of malnutrition, but there is a tendency to over-estimate that factor and anyone with long experience of tuberculosis in cattle will know that good feeding during youth is by no means a safeguard. Blackleg, again, is no respecter of condition—indeed, good-conditioned animals appear to suffer most. But the bacterial diseases such as scours, pneumonia, dysentery, and so on are all more likely to attack the weakling than the strong. There is another aspect which should not be overlooked: there can be no question that a variety of food means better growth and better health and greater

fertility. Under really natural conditions there is a wide variety in the food of cattle, but the trend of development in some parts limits the variety of foods very greatly—a fault which can easily be remedied by supplementing the grazing with crops.

Turning again to those diseases which are due to bacterial action, it is found that many of them are associated with deficiency in the food, and also with the method in which the food is supplied to the animals and with the general care and management. It cannot be expected that calves will do as well on skim milk alone as they will on full milk, but it is possible to make up the deficiency. It is not to be hoped that calves and young pigs which are fed under uncleanly conditions will always escape infection with disease—the remedy lies in seeing that they are fed, as far as possible, in a clean and wholesome manner. Tuberculosis, of course, stands rather by itself, and no amount of cleanliness, nor the giving of supplements with skim milk will prevent infection if tuberculous milk is fed to young pigs and calves. Elimination of tuberculous cattle from the herd will put an end to the economic loss involved.

Regularity in Feeding.

Although food supplied to live-stock may be ample in amount, contain the ingredients which the animal requires, and be supplied under wholesome conditions, the best results will not be obtained unless some regularity of feeding is provided for. This applies more particularly to horses, calves, and pigs. The horse has a digestive system of some peculiarity. His stomach is for the size of the animal very small. He has no gall bladder. The first portion of his small intestine describes a curious S-shaped curve, which is very apt to become blocked, and he has a very capacious, large intestine which varies very markedly in diameter. The horse was evidently intended to be an animal which ate fairly constantly in small quantities, and where he is grazed naturally, that is exactly what he does. But under the working conditions of civilisation it becomes necessary for the horse to spend long hours without eating, and to consume comparatively large quantities of food at one time This, together with other details in horse management—or mismanagement—results in that most serious disease in the horse—colic. It is very easy to overload a hungry horse's stomach, and the consequent enlargement leading to pressure on the intestine is difficult to overcome. It is also very easy when horses are run down by long-continued malnutrition to produce a condition of impaction of the large intestine; a long-continued case of such impaction is not easy to cure. Besides purgatives, the animals require stimulants and judicious feeding. The prevention of colic in the horse may be summed up as follows: Provide good food in small quantities, as often as possible; feed regularly; allow plenty of water at all times; do not make the food too bulky for a working animal, but provide part of it as grain.

Similar conditions exist in the case of pigs and calves, which are fed large quantities of fluid or sloppy food at long intervals. The state of distension

shown by some animals fed under such conditions is unnatural and not conducive to health. Scours, lymphangitis, and gastric and intestinal weakness are the common result.

During a recent dry spell, a number of cases of what is called "forage poisoning" were reported from various centres. Mention has been made of somewhat similar cases when dealing with the eating of rabbit carcases. Horses are, however, the most common victims of forage poisoning. It is not always easy to decide that there is anything wrong with the forage, and the history of each case yields the most useful information in connection therewith. At times the cases are associated with the eating of mouldy forage, but by no means always. The symptoms shown are those of a paralysis of the organs of the digestive tract and of the muscles. It is inadvisable to use mouldy forage; if it must be utilised, it should be with caution. Forage which has been badly contaminated with the dung of mice or other rodents is also to be suspected.

Rural Life in Denmark.

Rural life in Denmark forms a vivid contrast to rural life in this country. Here the unrelieved monotony of the countryside has caused a rush to the cities and large towns. In Denmark the universal use of electrical energy has brought most of the comforts and some of the attractions of modern civilisation to the countryside, where contented people labour with a light heart.—E. O'Shaughnessy, in the *Journal* of the Department of Agriculture and Technical Instruction, Ireland.

Direct Marketing of Honey.

In the fall of 1921 the honey market of the country (U.S.A.) was in a deplorable condition, due to the great increase in production since 1917 and to the economic condition of the country. An interesting development arose from the fact that the majority of the bee-keepers of the country were unable to sell their 1921 crop through the usual wholesale channels, and to prevent a total loss many of them undertook to sell directly to customers More honey was sold in this way during the fall and following winter than ever before in the history of American bee-keeping, and the prices obtained for the honey were much better than could have been obtained in the usual markets. The method of selling also resulted in many people buying honey who did not do so previously, and in this way much permanent good resulted to bee-keeping. The rather remarkable results are shown by the fact that not only was the whole of the 1921 crop sold, but a considerable amount of honey left over from 1920 also disappeared. There was little help from manufacturers . . . . the housewives of the country used the honey which was sold. This offers a ray of hope to the specialist bee-keeper who fears the changes in wholesale prices, in that he has found it possible to sell large crops directly to the consumer.—Extract from a report of the U.S. Department of Agriculture.

Calcium Cyanide for Citrus Fumigation.

A Comparison with Sodium Cyanide.

W. J. ALLEN and W. B. STOKES.

In the *Agricultural Gazette* for December, 1923, some trials were reported that had been conducted on Murrumbidgee Irrigation Area with calcium cyanide as a fumigant for citrus trees, and mentioned that experiments would be conducted in some coastal district where the humidity of the atmosphere—of particular importance in fumigation with calcium cyanide—is greater.

It is the purpose of this article to set out the results of experiments conducted in the orchard of Mr. J. R. Chapman at Lismore in January and February, 1924, to compare the calcium cyanide dust treatment with the sodium cyanide method, and to determine the effects of the calcium cyanide under conditions of high relative humidity.

To determine the relative humidity a dry and wet bulb thermometer was used. Varying dosages of calcium cyanide were given, as it was thought that those recommended appeared too high. For the sodium cyanide treatment the revised table of 1903 was used without any variation of dosages. Owl's Fumigation Chart, Azusa, California, was used as a basis with the calcium cyanide dust method.

Certain instructions, as follows, are given in connection with the use of these calcium cyanide dosages:—

In calcium cyanide dust fumigation the tree is covered as for ordinary fumigation, and the dosages estimated in the same way. The distance over the tree from ground to ground, and the distance round the tree at a height of 3 feet are determined and referred to the attached chart. For example, a tree measuring 32 feet over and 36 feet round requires a dosage of 10 oz. as shown on the chart. For a full regular dosage of calcium cyanide, multiply the chart number by 2. Thus the tree whose dimensions were just mentioned would require 20 oz. of calcium cyanide.

Experiments to date have shown that a 75 per cent. dosage will be sufficient. The above dose (20 oz.) is considered 100 per cent. dosage, hence a 75 per cent. dosage will be 75 per cent. 20 oz. = 15 oz. Good results have been obtained with 50 per cent. dosages, but the results are not constant enough to be recommended. The required quantity of calcium cyanide is then weighed out, put into the duster, and blown under the tent. The dust may be applied in the same way using a dust machine, in which a measuring device has been incorporated.

The dust should be uniformly distributed throughout the tent, and this may be accomplished by discharging it vertically upwards from the ground near the centre of the tented area. The tent should be left on the tree for the usual time following the dust application, namely 45 minutes to one hour.

Further instructions given are:—

Many experiments in California have shown that there is a direct relationship between the relative humidity and the injury to the trees. In daylight fumigation the relative humidity at the time of fumigation should be 40 per cent. or less. This is particularly true of work at high temperatures. Late in the afternoon as the temperature drops the relative humidity may be somewhat higher, say 45 per cent. to 50 per cent. After dark the relative humidity may be as much as 70 per cent. to 75 per cent. Some experiments at 80 per cent. were without injury, but are really in the danger zone. Results tend to

show that the trees should be dry at the time of fumigation, but may become wet with dew or rain later providing the relative humidity at the time of fumigation is correct. In general, treatment is safe on dry nights or days with low relative humidity, but the middle of the day with its high temperatures should be avoided, unless the relative humidity is very low—that is, below 40 per cent.

Experience in this State has shown that daylight fumigation, except in late afternoon, is within the danger zone, especially in strong sunlight or high temperatures.

The results of the tests carried out at Mr. Chapman's orchards are summarised in the appended table, which shows the size of tree, time, humidity, calcium cyanide dose percentage, date, dosages of calcium cyanide and of sodium cyanide, and cost of each for same-sized tree.

COMPARATIVE COSTS of Fumigation with Calcium Cyanide and Sodium Cyanide.

Date.	Time of day of Treatment	Relative Humidity.		Size of Trees.				Dosages and Cost of Material.					
								Calcium Cyanide.			Sodium Cyanide.		
		Inside Tent.	Outside Tent.	Height.	Diameter.	Round.	Over.	Dosage	Dose percentage.	Cost.	Sulphuric Acid.	Sodium Cyanide.	Cost.
1924.	p.m.	per cent.	per cent.	ft.	ft.	ft.	ft.	oz.	per cent.	pence.	oz.	oz.	pence.
29 January ..	4·55	73	48		..	21	20	5	50	4·8	.	..	
	5·55		54	..		28	22	9	75	8·7			
	6·40		55	9	10	28	22	6	50	5·8	4	3⅔	3 7
6 February ..	6·35	95	81	7½	7	20	18	7½	75	7·2	2	2	2
	7·35	100	85	7	8	22	17	4	40	3·8	2	2	2
	8.40	100	85	7	9	25	18	3¼	33⅓	3·1	2½	2½	2·5
	9 45	100	90	7½	6	17	16	4	50	3·8	1½	1½	1·5
8 February .	6·30	90	80	8	10	29	23	9	75	8·7	3½	3½	3·2
	6·30	90	80	9	8		.				2½	2½	2 5
	8·0	89	100	8	10	23	22	5	40	4·8	3½	3½	3·2
	8·0	89	100	10	8	.			.		3	2⅔	2·7
	9 10	89	100	7	7	18	15	3	33⅓	2·9	1½	1½	1·5
	9·10	89	100	7	7	.	..	..	.	.	1½	1½	1·5

It will be noticed that humidity up to 100 per cent. was experienced during the test, and in some instances the trees were wet with dew. Damage was done by both methods to a slight extent, that is, young growth was killed and leaves fell from the trees. In one or two instances the fall of leaves was more than should have taken place, and one 75 per cent. dosage of calcium cyanide burnt several fruit. It must be remembered, however, that these tests were carried out under conditions that are considered to be severe (humidity up to 100 per cent. and the trees at times wet with dew). No serious damage resulted; the trees made new growth almost immediately after treatment, and the foliage is now as dense as one would desire. This is in marked contrast to many citrus trees in this district that have been sprayed with oils.

The principle scale insects on the trees treated were red scale and white louse. There were a few brown olive and wax scale, but not sufficient to warrant definite conclusions being drawn as to the kill that would take

place with these two last-mentioned scale insects. Both methods of treatment gave equally good results. Calcium cyanide killed red scale with all dosages given, namely, from 33⅓ per cent. to 75 per cent. dosages, and white lice were definitely killed with a 50 per cent. dosage. It is not known from these tests whether white lice can be killed with a smaller dosage. Sodium cyanide killed all red scale and white lice at the dosages set out in the departmental revised table.

Since the experiment described was carried out, arrangements were made with two other orchardists in the Gosford district to test the calcium cyanide method of fumigation. The work on one of the orchards was carried out during very humid weather, dews and fogs occurring almost every night, and rain fell at frequent intervals. Considerable damage was done, but in all probability was due more to over-dosages than to humidity. One section of trees was done during the afternoon of a dull day, with the result that practically all the leaves came off and many of the fruit. On the other orchard a start was made with a 25 per cent. dosage of calcium cyanide on one row of Emperor Mandarins, changing on the next row to 33⅓ per cent. dosage, and thereafter to a 40 per cent. dosage. These trees were examined recently, and it was found that red scale and odd fully-grown wax scale had been killed with a 25 per cent. dosage.

These tests have thus shown that calcium cyanide may be used in the humid coastal areas, provided care is exercised not to do the work during times of high relative humidity, or when the trees are wet, or during daytime. The safety zone of sodium cyanide fumigation is also generally controlled by these conditions.

The cost of the materials used in these tests, and set out in the table, is based on quotations obtained in Sydney on 22nd July, 1924, as follows:—Calcium cyanide, £6 10s. per 100 lb., or approximately 1s. 3½d. per lb.; sodium cyanide, 1s. 2d. per lb. in hundredweight lots, and sulphuric acid 16s. 6d. per cwt. or approximately 2d. per lb.

Outbreaks of Infectious Diseases Reported in July

It is proposed to publish each month in the *Agricultural Gazette* the number of outbreaks of the more important infectious diseases in the State of New South Wales reported in the last available month. The first return after the decision was arrived at is a particularly gratifying one, and stockowners will hope there may be many more like it. The outbreaks reported during July were:—

Anthrax	Nil.
Contagious pneumonia of swine	„
Pleuro-pneumonia Contagiosa	„
Piroplasmosis (Tick Fever)	„
Swine fever	„

—Max Henry, Chief Veterinary Surgeon.

The Green Peach Aphis and its Control.

W. B. GURNEY and W. LE GAY BRERETON.

A GREEN peach aphis appeared in the Glen Innes district in 1910, and has been troublesome there, and at intervals during succeeding years, and has appeared in various districts where peaches are grown, including the Murrumbidgee Irrigation Area.

The aphis must not be confused with the common black aphis of peach trees, but it is apparently identical with the green peach aphis of California and elsewhere (*Rhopalosiphum persicæ,* Sulz.), of which there are both winged and wingless forms, varying from dark to pale green in colour to yellowish; and some have dark patches on the body. They reproduce young viviparously through the summer, increase in numbers rapidly, and towards the end of summer males and females may appear which produce eggs which tide over the winter months. But in milder climates quite usually they are recorded as continuing to reproduce young and feed on weeds, &c., throughout the winter months without producing the egg stage. Whether they hatch from over-wintering eggs or spread from adjacent weeds or shrubs, they appear on the peach trees generally when the new foliage is appearing. It is apparent that to reach the eggs or young just hatching a spray of red oil or other miscible oil or lime-sulphur in late winter or early spring before the flower and leaf buds burst, is desirable. Excellent results were obtained in the orchard of the experiment farm at Glen Innes from the application of red oil spray in winter and early spring as recorded below.

Host Plants.

It is of interest that this aphis has been sometimes recorded in the United States on quite a large number of host plants, viz., on some forty different weeds, fruit trees, and vegetables, and also plants of the flower garden. The list of hosts includes apricot, plum, cherry, orange, cabbage, cucumber, turnip, tomato, potato, false mallow, malva, nettle, shepherd's purse, sow-thistle, snap-dragon, carnation, chrysanthemum, &c.

Oil Spray for Green Peach Aphis.

This aphis was very troublesome on the peach trees in the orchard at Glen Innes Experiment Farm some years ago. In 1910 experiments were carried out with red oil emulsified with 1 lb. of common soap to 20 gallons of water. The spray was applied on 29th January, 1910, when the trees were dormant and there was no visible sign of aphis. The following varieties were included in the experiment:—Elberta, Hale's Early, High's Early Canada, and Triumph. The treatment was entirely successful. The control trees of each variety became badly infested with green aphis, whereas the treated trees remained entirely clean—free from the aphis. A full report was published by Mr. Brereton in the *Agricultural Gazette,* April, 1911.

For two or three seasons following the experiment of 1910, all the peach trees were sprayed at the end of July or first week in August with red oil as above; later the treatment was omitted, and there was no outbreak of green aphis till the spring of 1917.

At the end of the winter of 1918 the treatment was repeated, using miscible spraying oil. Control trees were left untreated, and the result was exactly similar to that obtained in 1910. The control trees were simply left to satisfy the orchardist whether the aphis would have appeared or not, and to prove whether the treatment was effective. This treatment has not been carried on regularly at Glen Innes orchard every season because there has been no serious outbreak of green aphis there since 1917. A serious outbreak of this aphis is, of course, often preceded by a mild appearance of the aphis in the spring of the season before.

To meet the need, perhaps, of spraying with lime-sulphur for leaf curl and oil for green aphis, the trees are sprayed about mid-winter with lime-sulphur, and the oil is applied as late as possible with safety before the buds burst in spring.

Tobacco wash will kill the green peach aphis it comes in contact with, but on account of their habit of folding the leaves of the tree and hiding within, the spray must be applied copiously and at frequent intervals, and therefore it seems advisable to anticipate and spray in late winter or early spring with the oil, to obviate as far as possible the need for spraying with tobacco wash or nicotine sulphate in summer.

Control.

The control therefore consists of 1 gallon miscible oil with an adequate quantity of washing soda added, when required, to produce a thorough emulsion, to 25 gallons of water; this should be applied late in the winter or early in the spring, but not later than when the buds are just commencing to swell. This will check the aphis and obviate the need for summer spraying. Tobacco wash or nicotine sulphate spray is used where required as a summer spray, and repeated applications may be needed.

The Economics of Farm Management.

The most important results which the study of farm management, especially by accounting and statistical methods, has yielded and is still yielding are those showing the requirements in labour, food, or materials for various processes. In such matters as the labour requirements per crop-acre, or dairy cow, in man-days and horse-days per acre or year, the study has yielded such results as will soon make it possible to state extreme variations in their causes, together with the average or standard requirements. The establishment of standards of this character will be of immense value to farmers, especially such as are developing experience, in that they provide criteria for the results of their own management.—A. W. Ashby, in the *Journal of the Ministry of Agriculture*, London.

A "Shrivel" Condition of Grape Berries.

W. A. BIRMINGHAM, Assistant Biologist.

DURING the month of January, 1924, several districts in New South Wales experienced a period of excessively high temperatures, preceded and followed by comparatively cool spells. On 22nd January, Mr. S. A. Thornell, Orchard Inspector, Young, forwarded diseased bunches of grapes for examination. He stated: "As mentioned in a previous report, the downy mildew has made rapid headway lately, but last week the temperature here was about 104 degrees in the shade and vineyard owners were hoping that this would check the disease. On the other hand, it seems to accelerate it, as in two days some of the grape crops were ruined. In all vineyards inspected during the week the worst affected varieties are Gordo, Ohanez, Cornichon (white and purple) and Doradillo. The least affected are Waltham Cross and Black Muscat, the latter being almost immune. I also noticed that the vines on the heavy red soil seemed to be worse affected than those on the lighter sandy soil. . . . Many growers are very discouraged, as they sprayed two and three times with Bordeaux and yet lost the whole of the crop of the above-mentioned varieties."

The writer, in company with Mr. Thornell, visited the vineyards in the Young district. It was noted that in some cases the condition was more pronounced on the west side, but on the other hand, bunches well protected in the centre of the vines also showed the "shrivel" on the susceptible varieties. A small amount of downy mildew (*Plasmopara viticola*) was observed on the foliage in some cases, but had apparently been arrested by the hot, dry spell which prevailed. The "shrivel" condition was pronounced on vines on the foliage of which not a blemish appeared.

The conclusions drawn from this investigation were:—

1. That the condition was not due to the downy mildew fungus as was thought by many of the growers.
2. The vines had been subjected to excessive temperatures on a successive number of days.
3. Transpiration under the circumstances was so great that the root-system was unable to keep pace with a supply of moisture.
4. Under such conditions the plants would withdraw moisture from the fruit, causing the collapse of some berries.
5. That the trouble was due to adverse climatic conditions.

On 23rd January, Mr. A. Catley forwarded from Cowra Experiment Farm grapes showing the same condition. He stated that "the collapsed condition of the grapes was first noticed the week subsequent to a series of abnormally hot days."

On 24th January, Mr. E. West, Research Officer of the Water Conservation and Irrigation Commission, Griffith, submitted grapes showing the same shrivelled condition, writing as follows:—"The condition of these grapes is doubtless due to the weather conditions recently experienced here. The beginning of last week was cool, but the temperature rapidly rose during the week, and we had a short heat wave of very high temperatures, followed by a sudden cool change. . . . When freshly taken, from 25 to 50 per cent. of the berries on the bunches are soft and pulpy and brown in colour. Some of the berries are simply wilted, retaining their colour. The foliage of the vine is generally quite healthy and shows no ill-effects from the hot weather. . . . No mildew or other diseases have been noticed in these vineyards. Some growers in the district will sustain heavy losses from this cause."

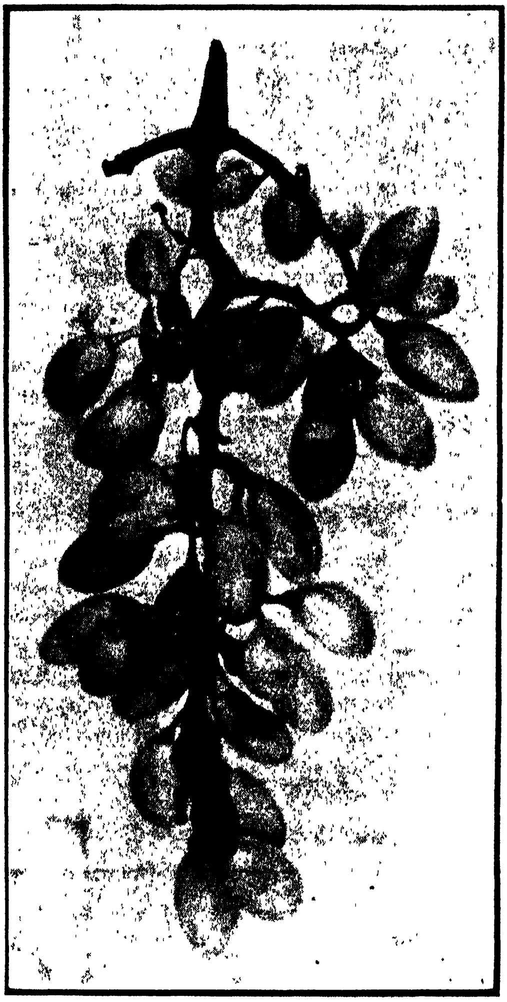

Fig. 1.—Grape "berry wilt"—early stage—on Black Cornichon variety at Young.

On 13th February, Mr. H. L. Manuel, Viticultural Expert, stated: "A similar condition appeared in the Albury and Corowa districts. The condition occurred during a heat wave which followed a cool spell."

The temperatures recorded (degrees Fah.) at Young, Griffith, and Albury from Saturday, 12th January, to Sunday, 20th January, were as follows:—

	Sat.	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
Young:—Max.	80	82	93	98	102	104	103	98	87
Min.	45	43	51	60	63	64	69	69	63
Griffith:—Max.... ...	72·5	85·5	93·0	104·0	109·6	104·0	108·5	107·0	63·5
Min.	54·5	62·0	70·0	82·0	70·5	74·0	80·5	59·0	53·5
Albury:—Max.... ...	73	86	97	104	108	102	107	103	78

Fig. 2.—Grape "berry wilt"—advanced stage.
Left.—Doradillo variety. *Right.*—Sabalskanski variety.

The maximum readings at Cowra for the five days preceding discovery of the disease were 105, 108, 110, 102, and 95 degrees. The minimum figures for Albury and Cowra are not available.

[Photographs by Mr. W. J. Reay, Biological Branch.]

Old Agricultural Gazettes Wanted.

The Department's stock of certain issues of the *Agricultural Gazette* either have been exhausted or have become very low, and it would be a consideration if any reader who has copies for which he no longer has a use would return them. The issues referred to are January, 1921, February, 1922, and March, 1922. The package may be addressed to the Under-Secretary and Director, Department of Agriculture, Sydney, and specially marked "Returned *Gazette*."

A Useful Bushel-pounds Conversion Table.

Following is a list showing the equivalent in pounds of a bushel of various seeds, &c., as demanded under the Weights and Measures Act:—

Commodity.	lb. per bushel.	Commodity.	lb. per bushel
Amber Cane	60	Lucerne	20
Barley	50	Maize	56
Beans	60	Oats	40
Bran	20	Planter's Friend (sorghum)..	60
Broom corn	50	Peas	60
Buckwheat	50	Pollard	20
Clover (Red or White) ...	20	Rye corn	60
Grasses (Couch, Cocksfoot, Paspalum, Rib and Rye)...	20	Sorghum	60
Hungarian millet	60	Tares or vetches	60
Imphee (sorghum)	60	Wheat (seed)	60

"Productive Poultry Husbandry."

The large and ever-increasing demand for poultry products, together with the tendency for specialisation in this as in all industries, has in recent years occasioned an unprecedented interest in both practical and scientific aspects of the business. A position has now been reached at which no breeder or poultry-farmer can afford to neglect the sources of sound information.

Unfortunately, there has been a vast increase in the class of material that is purely theoretical, and that—possibly sound in some ways—leads men to attempt experiments they should never essay. Experiments are right enough, no doubt, in their place, but their place is not in the management of the whole flock, and it is just here that many hard-working and well-intentioned poultry-farmers have gone astray with disastrous results. Experiments, if attempted, should be confined to small groups of birds under strict supervision.

This warning is necessary in mentioning a book that, good in itself in many respects, might lead some readers to depart from safe and well-trodden paths. It comprises nearly 600 pages, well illustrated, and systematically covering the whole industry. In the main, of course, it is written for American conditions, and the arrangement has class-room requirements well in view. To students of the subject the work will no doubt be of value. The author is H. R. Lewis, of the New Jersey Agricultural Experiment Station and State University.

Published by J. B. Lippincott Company, London, from whom comes our copy.

Milk Recording in Denmark.

In 1895 the first Danish Milk Recording Society was formed by thirteen farmers, who owned together just over 300 cows, and who combined to employ a man to record the yield of milk and its content of butter-fat from each cow on their farms. Other groups of farmers followed suit as the practical value of the information obtained and its importance in cattle-breeding became recognised. Now there are in Denmark 825 recording associations, dealing with 25 per cent. of all the cows in the country, or upwards of 300,000.—*Scottish Journal of Agriculture.*

Poultry Notes.

SEPTEMBER.

JAMES HADLINGTON, Poultry Expert.

POULTRY WORK IN PROGRESS AT HAWKESBURY AGRICULTURAL COLLEGE.*

WHAT is being done at the College to further the interests of the poultry industry, is a question that is often asked. Evidently neither the College nor the Department has cultivated the art of window-dressing, or a reply at this stage would not be necessary.

It is presumed that in propounding this question poultry-farmers have in mind experimental and investigational work, such, for instance, as feeding trials and the transmission of high fecundity. Unfortunately, it is not generally recognised that such experiments are not the work of a month or of a year. As a matter of fact, the preparatory work necessary to secure the material for experiments of this character takes as long as the experiments themselves.

Something in the nature of a progress report, covering much of the work done at the College during the past ten years, may be of interest. To some of the older breeders who know the College poultry section, it may seem somewhat superfluous, but there are those who are recent recruits to the industry, and who have come on the scene to find things as they are, without knowledge of their history. For our survey we may take 1914 as a convenient starting point.

With the small number of stock being carried on the old poultry section at the College experiments were out of the question. Hence it was that prior to the year mentioned any attempts at experiments were made in connection with the egg-laying competitions.

It is obvious that stock for experiment work should be of an even character, in breeding, age, and development, and this was not obtainable in a competition comprised of birds from ninety to a hundred different sources, and the experiments, therefore, could not be regarded as scientific. Last year about 350 pullets were absorbed in experimental work at the College, which meant that some 1,000 chickens had to be raised for that purpose alone.

The first essential in 1914, then, was the establishment of a poultry section of some dimensions. On entering the Department, the first item in my policy was the building of a poultry section that should serve the dual

* This matter was read as a paper at the Poultry Conference at Hawkesbury Agricultural College, 21st June, 1924, and in view of its importance to the industry it is published in this form.

purpose of providing material for first-class instruction in poultry culture for College students, and of serving as a demonstration farm that would be a source of education in advanced methods of poultry-farming for those entering the business. A third objective had also to be kept in mind, for stock had to be raised in such numbers as would permit of experiment work being carried out on sound lines.

The Introduction of Single-pen Testing.

Following upon the building of the poultry section in 1914, it was decided in 1915 that the time had arrived when, in the interests of the industry, it was advisable to put the whole of the egg-laying competition on a single-hen basis. Previous to that only sixty single pens had been in use for a couple of years, the bulk of the competitions being run in groups of six hens.

Plans were prepared, and the Department found the money to build the 540 single pens that now house the competitors. Another thirty were built at the same time for testing College stock. The following year (1916) the whole of the competing pullets were single-pen tested.

The benefit arising out of this single-pen testing is that, instead of the average laying of six hens being returned to the competitors (each pen containing perhaps some very good and some bad layers but without any identification as to which was which) the tally of every hen competing, with an identification number on her leg band, has since been returned at the completion of each test.

Thus, the Department has during the past eight years returned to their owners no less than 4,320 tested hens, each hen being identified. If put to proper use, these hens should have been of very material assistance to the commercial poultry-farmer in his breeding for high egg production. This is something, surely, that has been done to further the interests of the industry.

Testing for High Fecundity Transmission.

We now turn to the more direct experiment work being carried on at the College. As before mentioned, the testing of College stock commenced with thirty single pens in 1916; last year we had sixty single hens testing. During the eight years some 300 hens have been single-pen tested, in addition to flock-testing of the progeny of some of these. Thus an enormous mass of figures relating to such testing has been accumulated.

In the meantime, the agricultural section of the Royal Society had, in 1918, become interested in Dr. Raymond Pearl's work on the transmission of high fecundity, and it suggested to the Department that experiments should be carried out at the College with a view to testing Pearl's conclusions. To form a basis for this experiment, a synopsis was drawn up from Pearl's work, which I estimated would take ten years at least and not less than £5,000 to carry out. The result was that the Royal Society drew up a modified test, with a view to getting some indication in a much shorter period.

This experiment was laid out as follows:—

(1) 1 White Leghorn cockerel mated to 6 White Leghorn hens and 6 Australian Game hens.

(2) 1 Australian Game cockerel mated to 6 Game hens and 6 White Leghorn hens.

Thus the progeny would be:—Leghorn-Game cross; Game-Leghorn cross; Leghorn pure; Game pure.

The idea underlying the experiment was to test the crossing of a bad laying breed with a high laying breed.

It will be remembered that Dr. Pearl had asserted that high fecundity is carried through the male bird, and that the laying capacity of the female is of no importance in the immediate results, but that low fecundity could be carried by both male and female. If this had been proved in crossing, the Leghorn averages should have been maintained in the Leghorn-Game cross, and the low productive capacity of the Game would have been reflected in the Game-Leghorn cross.

However, the results of the flock-testing of the progeny of these matings were:—

	Per hen.
Leghorn-Game Cross, average for 12 months	112·2
Game-Leghorn ,, ,, ,, ,,	117·4
Pure Leghorn ,, ,, ,, ,,	193·5
Pure Game ,, ,, ,, ,,	51·7

The Leghorn cockerel used in the cross was the son of a hen that laid 293 eggs in twelve months. As will be seen, the average of the Leghorn pullets sired by this cockerel was nearly 100 eggs short of the performance of his dam. I am not citing this experiment as being in any way conclusive, but as showing what is involved in such experiments, even after years of testing has been done.

As to the experiment generally, it must only be regarded as an attempted short cut to explore some of the possibilities arising out of Dr. Pearl's investigations in the science of genetics in connection with poultry. It is understood that his investigational work occupied thirteen years. In this connection it is as well to remember that whatever purely scientific interest attaches to the work, the only suggestion of a practical nature that the poultry-breeder has been able to gather from it is the assertion that high fecundity is transmitted through the male bird. This had almost come to be accepted as gospel by poultry-breeders until later on Professor James Dryden gave the result of his researches in genetics, extending, I believe, over ten years. His conclusions were that the transmission of high fecundity was not a sex-limited character.

After eight years of testing single hens and breeding from them mated to tested-bred males, I failed to find any evidence in support of Pearl's conclusions on the matter in question. However, this research work is now being energetically pushed forward by Mr. Southee, Principal of the College, in conjunction with myself. Recently Mr. Southee has carried out a very extensive survey of all the pedigrees and figures arising out of eight years'

breeding and testing. This has involved an amount of charting and isolating characters that would seem almost incredible to the uninitiated. The problem is a most complex one, and not at all the simple matter some have imagined it to be, and the breeder who mates a male bird bred from a high-producing hen to low-producing hens in the fond hope that he is on the "royal road" to establishing a high-producing strain is deceiving himself.

Feeding Experiments.

Other important work that is being carried out at this College is a series of feeding tests extending over three years. These tests have been designed principally to find substitutes for pollard and bran as articles of diet, and their bearing upon egg-production. The following are the results of the feeding tests that have been carried out so far, only White Leghorn pullets being used for the purpose:—

No. of fowls.	Particulars of Ration fed.	Average per hen
	Season 1921-22.	
40	College ration (pollard 60 per cent., bran 20 per cent., lucerne meal 15 per cent., M.I.B. meatmeal 5 per cent.)—check pen...	157
40	Pollard 60 per cent., bran 5 per cent., lucerne meal 30 per cent., M.I.B. meatmeal 5 per cent.	146
40	Pollard 40 per cent., wheat meal 20 per cent., bran 5 per cent., lucerne meal 30 per cent., M.I.B. meatmeal 5 per cent. .	124
20	Grain only (⅔ wheat, ⅓ maize)*	95
	Season 1923-24.	
30	College ration (see above)—check pen	152
30	15 per cent. oaten pollard instead of that amount of wheaten pollard, balance as per College ration	127
30	Pollard 60 per cent. (15 per cent. being oaten pollard instead of that amount of wheaten pollard), bran 10 per cent., lucerne meal 25 per cent., M.I.B. meatmeal 5 per cent.	128
30	Pollard 30 per cent., wheat meal 25 per cent., bran 15 per cent., lucerne chaff 25 per cent., M.I.B. meatmeal 5 per cent.... .	125
15	Grain only (⅔ wheat, ⅓ maize)*	75
50	Wet mash (pollard 60 per cent., bran 35 per cent., M.I.B. meatmeal 5 per cent.). Grain ration given at night	161
50	Dry mash (pollard 60 per cent., bran 35 per cent., M.I.B. meatmeal 5 per cent.). Grain ration given at night...	133

* With the idea of balancing the ration, M.I.B. meatmeal was continually before the hens, but very little was eaten.

Salt was added to all mash at the rate of 22 ounces to every 100 lb. of mash, and Epsom salts was given once a week to all pens.

The circumstances that called for these experiments were the almost chronic shortage and high price of mill offal extending over several years.

It might be observed that, as in this case, there is very often a demand for experiments, the need for which has disappeared by the time a conclusion is reached. Similar experiences, however, will inevitably recur, and meantime it is intended to proceed with feeding experiments, not so much with a view to finding substitutes as with the object of ascertaining what variations may take place as to ratios.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize :—

Boone County White	J. Chittick, Kangaroo Valley.
	Manager, Experiment Farm, Berry.
Craig Mitchell	K. W. D. Humphries, Muswellbrook.
Early Morn	H. S. King, Llangothlin.
Fitzroy	Manager, Experiment Farm, Grafton.
	A. M. Hooke, Taree.
	F. W. Hill, Yarramalong.
Funk's Yellow Dent	N. C. Pyemont, "Moondarra," Gundagai.
Golden Beauty	A. M. Hooke, Taree.
Golden Glow	W. A. McLeod, Ben Lomond.
	J. A. Reynolds, Ben Lomond.
Hickory King	J. Campbell, Wingham.
	W. Cole, "The Grange," Pambula.
Iowa Silvermine	H. Mallaby, Farm 1864, Griffith.
Large Red Hogan	G. E. Levick, Taree.
Leaming	Manager, Experiment Farm, Grafton.
Manning Silvermine	H. E. Smart, "Purfleet," Taree.
Pride of Hawkesbury	Dempsey Bros., Taree.
Sundown...	J. S. Whan, Llangothlin.
Wellingrove	Manager, Experiment Farm, Glen Innes.

Millet :—

Hungarian	Manager, Experiment Farm, Yanco.
Japanese	Manager, Experiment Farm, Coonamble.

Sweet Sorghum :—

Collier	Manager, Experiment Farm, Grafton.
Early Amber Cane	Manager, Experiment Farm, Bathurst.
Honey	Under-Secretary, Dept. of Agriculture, Sydney.
Orange	Manager, Experiment Farm, Yanco.
Red Amber	Manager, Experiment Farm, Glen Innes.
Selection, No. 34	Manager, Experiment Farm, Yanco.

Grain Sorghum :—

White Yolo	P. A. R. Gersbach, Leeton.
Feterita	Manager, Experiment Farm, Coonamble.
Kafir	Principal, H. A. College, Richmond.
Manchu Kaoliang	Manager, Experiment Farm, Bathurst.
Milo	J. T. Maunder, The Wilgas, Pallamallawa.

Dual-purpose Sorghum:—	
Darso	Manager, Experiment Farm, Glen Innes.
Sudan Grass:—	
Sudan Grass	Manager, Experiment Farm, Coonamble.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Yanco.
Grass:—	
Elephant...	Principal, H. A. College, Richmond.
	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Yanco.
Kikuyu	Principal H. A. College, Richmond.
	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Yanco.
	Manager, Experiment Farm, Cowra.
Wimmera Rye	Manager, Experiment Farm, Temora.
Potatoes:—	
Coronation	J. A. Reynolds, Ben Lomond.
Early Manistee	G. W. Kelly, Caves-road, Oberon.
Early Rose	G. W. Kelly, Caves-road, Oberon.
Factor	G. W. Kelly, Caves-road, Oberon.
	K. Bowen, "Newport," P.O. Orange.
Langworthy	G. W. Kelly, Caves-road, Oberon.
	K. Bowen, "Newport," P.O., Orange.
Late Manhattan	K. Bowen, "Newport," P.O., Orange.
Satisfaction	G. W. Kelly, Caves-road, Oberon.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

SHEEP AND WHEAT IN THE SOUTH-WEST.

"I HAVE a closer settlement farm of 320 acres, of which I farm 300 acres, 150 acres being fallowed each year. I am at present running about eighty sheep, and consider that I could run many more than that number if I grew some green fodder crop on my fallow. Are there any crops I could sow on early fallow—say, June or July—with something to follow later? I would like, of course, something that would not harm the fallow much for the following wheat crop."

The writer of the foregoing, a resident in the Young-Grenfell district, was informed that the most suitable crops for that part of the State for sheep feed were oats for winter and spring and Sudan grass for summer. A small area of lucerne was, of course, of great value. It was too late to sow any crop during June or July. The best way to provide feed was to sow portion of the wheat stubble with oats early in April. This crop would provide good grazing during most of the winter and well into spring. The land could then be ploughed up and put in good order for sowing wheat the following year. A suitable variety for that district was Sunrise, which had given very good results at Cowra Experiment Farm. Sudan grass should be sown in the spring, as soon as danger of frosts was past. About 8 lb. of seed were required per acre. Sowing should be carried out with a wheat drill, using every drill; it was facilitated by mixing the seed with superphosphate at the rate of about 56 lb. of the fertiliser per acre. The crops mentioned were very suitable for sheep feed, and land used for their production could be just as profitably used for wheat—in fact, more profitably, as it was kept more free from weeds and diseases.—A. H. E. MCDONALD, Chief Inspector of Agriculture.

The Queen Bee Competition at Wauchope.

FINAL RESULTS.

W. A. GOODACRE, Senior Apiary Instructor.

THE full complement of tests being concluded, the final figures for the competition conducted at the Government Apiary at Wauchope during the past year are now made available. Mr. G. G. Phillips has secured the highest number of points for the best queen bee, and also for the best group of queen bees—a commendable performance. The bees in the group are of the three-banded type, with an apparent slight mixture of Ligurian (leather) strain.

Mr. E. J. Gibbs' queens in securing second place showed very creditably. Mr. F. Coleman's queen No. 12 secured a high award in the individual test. Both of these groups are of the three-banded type. Mr. Geo. James' queen No. 6, which was doing so well in the individual test, but which was superseded towards the close of the competition, was of the golden type. It would have been interesting to have been able to secure the full results of her test.

The total points of the four leading colony groups in the group section are as follows:—

G. G. Phillips' group, 1,619 points.
E. J. Gibbs' group, 1,536 points.
L. Smarts' group, 1,520 points.
F. Coleman's group, 1,386 points.

The total points of the four leading colonies in the individual test are as follows:—

G. G. Phillips—No. 16 queen, 627 points.
E. J. Gibbs—No. 3 queen, 599 points.
F. Coleman—No. 12 queen, 592 points.
G. G. Phillips—No. 18 queen, 580 points.

The Gentleness Test.

It is desirable to have in the apiary colonies which during manipulation will not (under normal conditions and when properly handled) cause discomfort to any extent to the apiarist by stinging. It is not unusual to find a few colonies causing a deal of annoyance, especially where hybrid bees are kept. Not only do they cause trouble when their own hive is being manipulated, but when other work about the apiary is being performed

they are also troublesome. The majority of apiarists prefer to change the breeding of the troublesome colonies, by introducing good queens from a more even-tempered strain.

In specialising in breeding we aim at producing high standard bees, pure to type, which can be worked without noticeable discomfort when handled correctly. A colony that is considered by a competent man to be of good temperament may, in the hands of a novice, be classed as rather an ill-tempered one; the fault there lies in the handling. It should be the aim of the beginner to learn how to manipulate the hives correctly. Bees show signs of preparation for attack, and a couple of puffs of smoke from the smoker, delivered before hostilities begin, saves a good deal of discomfort both to the bees and the bee-farmer. With a little observation of the actions of the bees during manipulation one will soon learn the signs of preparation for attack, and be in a position to quieten the bees in time.

The question of discomfort during manipulation was considered in the awarding of points in the queen bee competition. It was found that by using good methods each colony could be worked with comfort, and none exceeded a certain limit in their stinging capacity. It was decided, therefore, to award ninety points to each colony.

The Disease-resisting Test.

It has been proved that by selection in breeding strains of bees showing greater resistance to disease can be produced. The Italian bee in the first place shows greater resistance generally to such diseases as European foul brood (*Bacillus pluton*) and sac brood, than the old black bees or hybrid races. We find, too, that much can be done in breeding to overcome dwindling and paralysis in bees. The first action on the part of the apiarist, where the diseases mentioned occur in his apiary, is to introduce a good Italian queen from a strain showing resistance. It should be clearly seen, therefore, that in the selection of breeding stock a disease-resisting test is of much importance.

A number of the competition colonies were affected with "dwindling" during the spring, and some points were lost. While dwindling is not classed as a serious malady or disease and is rather common, with more care in the selection of breeding stock the trouble can be greatly reduced.

No serious disease occurred in the competition colonies.

The points awarded for disease resistance (maximum 100) were as follows:—

G. G. Phillips, No. 16, 90; No. 17, 85; No. 18, 90; total, 265 points.
G. James, No. 4, 85; No. 5, 90; No. 6, 90; total, 265 points.
E. J. Gibbs, No. 1, 90; No. 2, 85; No. 3, 90; total, 265 points.
L. Smart, No. 13, 80; No. 14, 85; No. 15, 90; total, 255 points.
F. Coleman, No. 10, 85; No. 11, 80; No. 12, 90; total, 255 points.
Cushan Bros., No. 7, 80; No. 8, 80; No. 9, 90; total, 250 points.

The Stamina Test.

The question of stamina in a queen bee competition has reference to the majority of individual tests. Without stamina, a queen bee or her progeny could not hope to give successful results. In the building-up test, the queen bee could be classed as an egg-laying machine, for, as previously mentioned, the number of eggs laid daily often total several thousands, and it requires stamina to keep up this work. Stamina also plays an important part in disease resistance, honey gathering, and in wintering. It may be evident in one test and lack of it may be shown in another. The results obtained in our competition should clearly show to all the vital importance of a thorough test in the selection of breeding stock. The leading colonies in the competition gave excellent general results right through.

The points awarded in the stamina test (maximum 100) were as follows:—

G. G. Phillips, No. 16, 90; No. 17, 70; No. 18, 83; total, 243 point.
E. J. Gibbs, No. 1, 80; No. 2, 65; No. 3, 86; total, 231 points.
L. Smart, No. 13, 70; No. 14, 77; No. 15, 84; total, 231 points.
F. Coleman, No. 10, 67; No. 11, 65; No. 12, 85; total, 217 points.
Cushan Bros., No. 7, 64; No. 8, 64; No. 9, 70; total, 198 point.
G. James, No. 4, 64; No. 5, 70; No. 6, no test; total, 134 points.

Co-operative Marketing of Eggs in Ontario.

During the last seven or eight years the farmers of Oxford county, Ontario, have been marketing a considerable portion of the eggs produced in the county through the medium of some twelve local "egg circles" established at various points. These circles are independent, and are maintained by means of small membership fees, deductions from returns from shipments, and deferred payments for eggs. Though not incorporated, the circles are all properly organised, having a board of directors, and a fixed constitution and rules. For the year 1922 seven of these egg circles, with a membership approximating 900, handled 22½ car-loads of eggs, which netted the members 123,758 dollars, giving a clear profit of 10,408 dollars more than could have been obtained at the average store prices.—*Journal* of the Department of Agriculture and Technical Instruction, Ireland.

The Minister for Trade and Customs, the Hon. H. E. Pratten, desires again to notify all persons seeking tariff concessions on machinery, machine tools or appliances for manufacturing purposes, that application must be made and decision received before the required articles are ordered from abroad. Such concessions can only be granted if the Minister is satisfied that the machine, machine tools, or appliances cannot be commercially manufactured in the Commonwealth. If the application is made prior to order, it is possible that the Customs Department may be able to supply the applicant with the names of manufacturers in Australia.

Orchard Notes.

SEPTEMBER.

W. J. ALLEN and W. LE GAY BRERETON.

THE rapidity of evaporation of soil moisture in the spring is each year liable to cause surprise, even to those of long experience, and unless one is prepared, a dry spell, which is likely to occur some time during the spring, may cause a serious loss of stored moisture. It is risky to allow such a loss even in a spring following a wet winter, when the subsoil has been soaked to a great depth, but in a season such as this, when most localities have experienced practically no soaking winter rains, the risk is far greater and might easily have disastrous results on the coming crop of either deciduous or citrus fruits. Hence a good soil mulch is of the utmost importance.

The method employed will depend on previous work and conditions. If the ground has become too compacted since the autumn or winter ploughing by rains or by trampling in connection with spray operations, or if weed growth has got ahead, the cultivator may not be capable of giving the required working, and another ploughing may be necessary. It may be mentioned here that, although the cultivator is a useful implement for getting over an area quickly when various duties are simultaneously calling for attention, and though in many cases it is indispensable, still the plough does the more thorough and lasting work.

Pests and Diseases.

All apple and pear trees should be examined, the loose bark removed and carry-over grubs killed which may be harbouring beneath. The rolls of bark that form where the main limbs junction at the crown, and all holes or crevices in the bark, as well as the bandages which have been left on the trees over winter, should all be examined.

All cases or other receptacles which have contained infected fruit should be dipped for not less than three minutes. To be effective this work must be carried out before the moth starts to develop from the carry-over grub.

The packing shed should also be made moth-tight before this period, and the emerging moths killed as they fly to the light of the window.

It is from the carry-over grub only that the pest makes its start the following season, and the importance of reducing these can be gauged if it is remembered that one female moth is capable of laying eighty eggs. Such clearing up of the carry-over grub is doubtless costly; but it is little use

going to all the expense of spraying if one does not make the effort of first reducing the source of the trouble to a minimum.

Some of the earlier blossoming apples and pears in the coastal districts will be ready for the first calyx application towards the end of the month; but the bulk of this spraying in the tablelands and inland parts will not start till the middle and latter part of next month. Many of our pear and apple districts are fortunate in not being very liable to outbreaks of black spot, and even in those districts that are liable very little spot was present last year. Such seasons of freedom tend to make one careless, and apple and pear-growers in districts liable to outbreaks should apply the initial sprays of fungicide at from the spur-bursting stage to the pinking stage. Then, should the weather turn unfavourable to disease, the later sprays can be omitted. This matter was dealt with rather fully in these notes for September last year, and as leaflets can be secured from the Department it is unnecessary to repeat here the remarks then made.

It should be remembered that tobacco wash free from soap or soda, and also some of the commercial tobacco extracts, can be mixed with either lime-sulphur or Bordeaux mixture, so that if woolly aphis is showing on apple trees the nicotine wash should be combined with the fungicide that is being used for black spot.

Tobacco spray can also be combined with such sulphur sprays as atomised, atomic, colloidal, or hydrated lime-sulphur when used for apple mildew. The first application of fungicide for apple mildew should be applied from spur-bursting stage to pinking stage. Where lime-sulphur is being used for black spot, and where it has failed to control the mildew, either of the first three of the abovenamed sprays can be combined with the lime-sulphur. If care is taken an excess of lime-sulphur can be allowed when diluting it, and the right quantity of sulphuric acid added to precipitate this excess, which will give the desired combination.

As in the case of apple and pear growers, grape growers should apply the initial applications of Bordeaux mixture for black spot and downy mildew, regulating the later applications according to weather conditions. The applications for downy mildew have to be continued to a later period than those for black spot.

Leaflets on treatment of apple mildew, black spot, downy mildew, and oidium of the grape vine can be obtained on application to the Department of Agriculture, Sydney.

A watch should be kept on peach, nectarine, and Japanese plum trees, and on first appearance of aphis they should be promptly sprayed with tobacco wash or with one of the commercial nicotine extracts. Use a high-pressure and drenching spray by holding the nozzle close to all affected parts to break up the clusters of the insects, and repeat the operation within two or three days if any live aphis are still present.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Ganmain A. & P. Association	A. R. Lhuede	Sept. 16, 17
Cowra P. A. and H. Association	E. Todhunter	" 16, 17
Temora P. A. H. & I. Association	A. D. Ness	" 16, 17, 18
Junee P. A. and I. Society	T. C. Humphrys	" 23, 24
Canowindra P. A. and H. Association	J. T. Rue	" 23, 24
Murrumburrah P. A. and I. Association	W. Worner	" 23, 24
Wellington P. A. and H. Society	A. E. Rotton	" 23, 24
West Wyalong P. A. H. and I. Association	T. A. Smith	" 23, 24, 25
Burrowa P. A. and H. Association	W. Burns	" 25, 26
Barmedman A. and H. Society	T. P. Meagher	Oct. 1
Ardlethan A. Society	R. L. Neill	" 1
Hay P. and A. Association	C. L. Lincolne	" 1, 2
Corowa P. A. and H. Society	J. D. Fraser	" 3, 4
Berrigan A. and H. Society	R. Wardrop	" 7
Narandera P. & A. Association	W. H. Canton	" 7, 8
Ariah Park A. Society	J. F. McInnes	" 8
Carcoar H. C. and A. Association	T. J. Brady	" 15
Deniliquin P. and A. Society	P. Fagan	" 15
Griffith A. Society	M. E. Sellin	" 15, 16
Gundagai P. and A. Society	C. S. Dale	" 29, 30
Lismore A. and I. Society	H. Pritchard	Nov. 18, 19, 20

1925.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 9, 10
Dapto A. and H. Society	E. G. Coghlan	" 16, 17
Northern Suburbs A. & H. Association (St. Ives)	F. Conway	" 16, 17
Kiama A. Society	G. A. Somerville	" 24, 26
Wollongong A. H. and I. Association	W. J. Cochrane	" 29, 30, 31
Yanco Irrigation Area A. Society (Leeton)	W. Roseworn	Feb. 10, 11
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	" 13, 14
Guyra P. and A. Association	P. N. Stevenson	" 17, 18, 19
Uralla P. and A. Association	D. T. McLennan	" 24, 25, 26
Newcastle A. H. and I. Association	E. J. Dann	" 24 to 28
Blacktown A. Society	J. McMurtrie	" 27, 28
Manning River A. and H. Association (Taree)	R. Plummer	Mar. 4, 5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	" 5, 6, 7
Mudgee A. P. H. and I. Association	R. Shaw	" 10, 11, 12
Cobargo A. P. and H. Society	T. Kennelly	" 11, 12
Crookwell A. P. and H. Society	C. H. Levy	" 19, 20
Cooma P. and A. Association	C. J. Walmsley	" 25, 26
Royal Agricultural Society of N.S.W.	K. J. Raffety	April 6 to 15
Gloucester A. H. and P. Association	F. S. Chester	" 22, 23

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Agricultural Gazette of New South Wales.

Cotton Growing in New South Wales.

Some Lessons of the Past Season.

H. WENHOLŻ, B.Sc. (Agr.), Special Agricultural Instructor.

ALTHOUGH some good crops of cotton have been grown in New South Wales during the past two seasons, it cannot be said that the climatic conditions have been sufficiently good throughout the State in either season to demonstrate the possibilities of the country in cotton-growing.

It is through failures that success is often achieved, and while many districts have so far failed badly in cotton-growing, a careful analysis shows that cotton may still be justifiably continued in the experimental stage in these districts. There are, however, also some districts where cotton has now been tried for two years, and where, though the seasons might not be described as exactly normal, nearly sufficient evidence is at hand to show that this crop cannot be reasonably expected to yield a sufficiently profitable crop in normal years or over an average run of years to be worth much further consideration. On the other hand, there are some districts where, as the result of two years' trial, cotton can be confidently recommended to take a place in the regular cropping system of the farm, and where at present the merits of the crop have not been considered in this way.

Suitable Districts and Soils.

Generally speaking, the results so far obtained from cotton-growing in New South Wales do not give any indication that the classification of suitable and potential cotton districts made by the Department last year can be improved upon. It is not intended here to refer at any great length to these districts (which have been repeatedly mentioned in departmental publications), except to say that the Clarence River district stands out so far as one of the best districts in New South Wales, if not in Australia. This opinion has been formed on the results obtained in the last two seasons, which have been decidedly adverse in comparison with the seasons which this district normally has. The upper valley of the Richmond, though producing some excellent crops in 1922, fared rather badly with cotton last season owing to the unusually dry spell, which lasted right up till Christmas, preventing early planting and good germination in spring. It may, however, still remain as one of the recommended districts. In the mid-Hunter valley, although good crops were also obtained in 1922, the past season was distinctly dry and unfavourable during the early part, and too wet and cool during the later part, and late plantings made poor yields, especially on the alluvial flats. Sufficiently good yields were made from some of the better hill soils here for this district still to be classified as one of the most suitable for cotton.

On the North Coast rivers, between the Clarence and the Hunter, reference has already been made to the fact that the lower average temperatures which prevail in comparison with both the Clarence and the Hunter have so far made these other North Coast rivers not quite as suitable for cotton, and few yields have yet been obtained to justify placing these other rivers among the recommended districts, although it must be conceded that last season the plantings were mostly too late for the best results to be expected. Further trials are, however, justified on these rivers.

No sufficiently good yields of cotton have yet been made south of the latitude of Sydney in coastal districts, but one fact seems to be outstanding with regard to the coastal districts south of the Clarence River, viz., that as we proceed further south (with the exception of the Hunter valley, where the temperatures are higher) strenuous efforts should be made to hasten the maturity of the crop for the best results. It seems that the further south we proceed the less fertile should be the soil for cotton, for there is little doubt that rich fertile soils have a considerable effect in promoting a heavy vegetative growth which delays the ripening of the bolls. At the same time, the inexorable rule must not be forgotten that too poor a soil will not produce a sufficiently profitable yield

On the North-western Slopes and Plains meteorological records and the experience with cotton in the last two years have shown that temperature is not likely to be a limiting factor in the growing of this crop, except in those districts like Inverell, Barraba, and Coonabarabran, which were always regarded as doubtful, and which must still be considered so. It has also been abundantly shown that, while cotton is comparatively drought-resistant, it is unable to withstand more than a certain measure of dry weather, and many districts with a low annual rainfall in the west will never be able to produce cotton successfully under natural conditions, except perhaps in odd seasons. It seems that this limit is set at about a 23 or a 25-inch annual rainfall, but many of the districts in the north-west with approximately this rainfall must still be considered to be in the experimental stage.

Although very little promise was obtained from cotton at Inverell last season, especially on the heavy soils, trials are to be continued on the lighter soils, but, as was forecasted, better promise for cotton obtains further west in the Warialda district, and a recorded yield of 900 lb. of seed cotton per acre by one grower there last season indicates some possibilities for this district. Although Moree has an annual rainfall of 23 inches, no promising yields have yet been recorded from that district.

Along the Namoi promising yields have been obtained from Gunnedah to Wee Waa, chiefly along the river and creek flats, although at Wee Waa the belah and brigalow soils are worthy of further experiments with cotton.

The Tamworth and Manilla districts will do better with cotton than they have done during the past two very adverse seasons, but it seems as

if the very rich alluvial soils in better seasons will produce too rank a growth, and the second-class alluvials or the best hill soils may be better suited to the crop.

On the Central-western Slopes the most promising results have been obtained, as was expected under the conditions of limited rainfall, on the fertile alluvial soils of the rivers and creeks, and it is largely on these soils that cotton-growing is likely to be continued longer, either as an experimental or as a regular side-line crop.

On the South-western Slopes, the areas likely to be suited to cotton contract rapidly in comparison with the north-west, chiefly because of temperature limitations, and in the Riverina the experimental areas of cotton will be greatly reduced next season because of the realisation that the crop has its limitations as a drought-resister.

The Murrumbidgee Irrigation Areas, together with the more limited Murray Irrigation Areas, unfortunately fared rather badly last season, owing to an exceptionally cool season, but the former area particularly, with its many settlers with young unbearing fruit trees, somewhat urgently needing an intertillable cash crop, cannot be put aside as a field for further trials.

Aids to Earlier Maturity.

In most districts of New South Wales, and particularly in those districts where the cotton crop yields have so far been disappointing through lack of a sufficiently long maturing period for the ripening of the bolls after encouraging vegetative growth has been made, it seems certain that artificial aids to an earlier maturity, several of which lie within the power of the grower to adopt, must be sought and applied. With such aids, better yields of cotton, as well as a more satisfactory grade, are bound to be produced, which will make cotton better thought of as a crop, where now the enthusiasm regarding it has a tendency to wane.

Being of such importance, the question of hastening the maturity of the cotton crop by means which lie within the power of the grower will be dealt with here in some detail.

Early planting is, of course, one of the first essentials for an early-ripening crop. Most cotton-growers are now aware of this, though last year they were mostly unable to put it into practice, partly through the late despatch of the seed, partly through replanting (rendered necessary by damage from caterpillars and cutworms), and through delayed planting, due to dry weather in spring. Unfortunately, the farmers on the North Coast had been previously misled by many responsible persons connected with the cotton industry advising that late planting was best to miss the monsoonal late summer rains during the ripening of the bolls, but this idea has now been safely "scotched."

Of course, there is a danger in planting cotton too soon in spring. If sown too early, poor germination and backward stunted early growth are likely, from which the crop rarely recovers properly. A fairly safe guide as to the best time for planting may be taken from American experience,

where the practice in all the cotton-growing States is to begin planting cotton about a fortnight or three weeks after the usual maize-planting time, and not to extend this planting period, even in long growing season districts, more than a month or so. Some odd crops may do well when sown later in these long-season districts, but the best results will mostly be obtained by keeping within the average period. In short-season districts, of which there are many in New South Wales as far as cotton is concerned, it is likely that cotton sowing should be completed in a week or a fortnight.

The reason for early cotton planting, even in long-season districts, will be apparent when the nature of growth of the crop is realised, *i.e.*, its indeterminate growth, producing flowers for several months. The earlier the plants can be induced to blossom the greater likelihood of a heavier crop of bolls maturing before frost, and thus, of course, of a heavier yield of better quality and grade of mature cotton. The latest cotton to ripen is usually of poorer quality and grade and more immature, which means it is more difficult and costly to pick, and of less value in actual price.

Nothing much can be said yet about the rôle of early-maturing varieties of cotton in hastening the maturity of the crop, except that the Department is working up seed supplies of early varieties likely to be better suited to most New South Wales conditions, and that some of these may be available next season.

The influence of fertilisers in inducing earlier maturity in the cotton crop is, however, somewhat marked, and must assuredly be taken more advantage of by the grower, especially in short-season districts. Little data is yet available as to which fertilisers are the best in this respect; but the Department is making trials in many districts this season. The indications from last season's few trials are that superphosphate has undoubted properties in this respect, resulting in the earlier maturity of the bolls by nearly a fortnight, and also signifying an appreciable increase in yield on this account.

The application of fertilisers on poor or second-class soils, particularly in coastal districts, as a means of augmenting the yields by increasing the soil fertility, cannot be ignored. It may be stated that in districts of good rainfall the poorer the soil the greater will be the comparative increase in the yield of the cotton crop from fertilisers. From some trials on the North Coast last year it seemed that the cotton crop may be raised from comparative failure to success on many soils by the use of fertilisers; this is particularly the case on red basaltic soils on the North Coast.

In cotton-growing under irrigation, the danger of over-application of water in prolonging the maturity of the crop is a vital one, especially in southern latitudes, such as the Murrumbidgee Irrigation Areas.

Insufficient data has yet been secured from spacing experiments in New South Wales to determine whether the maturity of the crop can be affected by different spacing distances. In America, the plan of late thinning and close spacing is adopted to assist in maturing the crop earlier.

Bound up with the question of spacing and its effect on maturity is also the influence of spacing on yield. The American experience may or may not be borne out in New South Wales. Although no actual yields have yet been obtained, there is a slight indication that the wider spacing of 18 inches to 2 feet apart in the rows in short-season districts has had the effect of maturing the crop earlier than closer spacing. On the other hand, on the North Coast, in one experiment, it was found that closer spacing gave a better yield. But no definite recommendation can yet be made as the result of these tests, and cotton-growers had better adhere to a medium distance, say 12 to 18 inches between the plants, when chopping out the thick stand.

Insect Pests.

Dealing with insect pests appears to be an unavoidable attendant feature of cotton culture, as this crop apparently attracts insects more or less injurious in most districts where it is grown even for the first time.

Although we are fortunately without the American boll weevil, and the pink boll worm which has found its way into Queensland, we have had the experience in New South Wales already of the damage which may be caused by the ordinary maize or tomato grub or cotton boll worm.

The boll weevil is spoken of in America as destroying 30 per cent. of the potential cotton crop of the country, but observations made last year in New South Wales on individual crops showed that the maize grub was responsible for destroying 60 per cent. of the potential crop. As a matter of fact, some late-sown crops on the Clarence River had a greater percentage of destruction than this, and in Queensland also the cotton crop, which was mostly late sown, was very greatly depleted in yield by the maize grub. Fortunately, these late sowings on the North Coast will mostly be avoided in the future, and this will remove the crop largely from the greatest measure of damage by this pest.

It must be borne in mind that the greatest damage from the maize grub is done to cotton, not in the boll stage, but in the young bud or square stage—a single grub being capable of causing the total loss of ten or fifteen young buds—while at the boll stage the grub confines its attention largely to a single boll. It will be seen, therefore, that if the crop can be pushed forward through the bud stage as early as possible it will suffer less damage, late plantings arriving at the bud stage when the grubs are more plentiful by reason of having increased to a large extent by passing through another brood or two. This will explain the importance of early planting in relation to this pest.

But the pest will still remain a potential source of damage to cotton, even when sown at normal times, in many districts, and although these notes will appear too late for cotton-growers to apply the most effective means of control, the methods mentioned have been referred to previously at a more seasonable time, and they should be seriously borne in mind at the right time next season.

Fortunately, the maize grub cannot be reckoned to be potentially as serious as the boll weevil of America, for the maize grub's advent in the cotton crop is more likely to be sporadic than on a perpetual increase, as the boll weevil seems to be in America, and it is also more subject to control methods. In Queensland it is being observed that the grub was heavily parasitised last season, and such great damage is not expected to occur again next year. A blind faith in the virtue of uncontrolled parasites, however, is not going to help the cotton-grower very much, and he is going to be better off by helping himself a little.

Undoubtedly the best means of control of the maize grub within the power of the cotton-grower (or the maize-grower either, for that matter) lies in the winter ploughing and cultivation at a time when the insect is in the ground in the grub or pupal stage, when it is most vulnerable. After eating to its fill, the grub of the last brood of the season drops to the ground in late autumn or winter, and sets about ensuring its safety in winter quarters. Where a crop has been heavily infested, and it is desired to grow a cotton crop reasonably free from the pest next season, the crop should be cleaned up early (sacrificing some of the late immature cotton) and the land ploughed thoroughly at once. This will destroy a good many grubs and pupæ by actual injury and by exposure to insectivorous birds.

It has been a very noticeable fact in Queensland and in New South Wales that the maize grub is more plentiful on the heavier soils than on lighter sandy soils, and some of the Queensland authorities have the theory that this is due to the softer, more sappy growth of cotton on heavy land being instinctively more attractive to the insects. The writer thinks that a more likely explanation is that the heavier soils usually ploughed up more solidly in lumps than the lighter soils, which are more completely broken up in ploughing, and that on this account many more of the wintering grubs or pupæ remain undisturbed in the heavier soil.

Quite apart from this fact, however, good farming entails that the heavier land should be given more working after ploughing than the lighter soil, and, seeing that the above explanation of the generally heavier infestation on heavier land may be most likely, the greater working of this land which is mostly necessary to provide a suitable seed-bed coincides with the greater destruction of the wintering grubs or pupæ. Better results may therefore reasonably follow from this increased attention to cultivation at this time, not ignoring it, of course, even on the lighter soils, after a heavy infestation of maize grub in either the maize or cotton crop, or any other crop which this omnivorous insect attacks.

Another matter deserving attention in connection with the maize grub, which came under observation last season, is that many farmers were found to be improperly following advice which was given in some cotton journals regarding the use of maize as a trap crop. On the principle that maize is more relished by the female moth on which to lay its eggs, many farmers had sown maize alongside their cotton "as a trap crop." Now maize is only relished for the most part by the female moths of the maize

grub in the silking stage, and as this period only extends over about ten days or a fortnight, it is obvious that three or four successive plantings of maize should be made to have the more attractive silking stage of maize spread over a longer time, if this trap crop idea is going to give much immunity to the cotton crop.

Further, when maize is grown as a trap crop in this way, it should be used as a trap crop, not being allowed to mature and to serve as a breeding ground for the pest, to the consequent damage of the cotton, as was seen in most, if not all, the cases which came under the writer's observation. Maize grown as a trap crop for the protection of cotton against the maize grub should be cut and fed green to stock a few weeks after silking.

From the writer's observation, the "trap crop" idea had better not be recommended, in view of its possible abuse and accentuation of the damage by the maize grub. It is felt that greater attention to the cultivation methods described, as well as to the clean after-cultivation of the cotton crop, will be better repaid.

Prospects for the 1924-25 Cotton Season.

It seems, of course, somewhat early to make any worth-while forecast of the cotton season for 1924-25 in New South Wales, but it is beginning to be recognised that the season for many crops starts considerably in advance of the planting time. With summer crops, and particularly with cotton, it will be realised sooner or later that the preceding winter weather (particularly the rainfall) has a vast influence (particularly with good farming methods to make use of it) on the following summer crop.

The bulk of the cotton in New South Wales this season will be produced on the North Coast and in the north-west, and even at this early date the bountiful rains (above the average) which have occurred in these parts during July and August must have a good influence on the prospects of the cotton crop this season. Particularly is this the case in the north-western districts, where the rainfall is the limiting factor in the growth of the crop.

As this is likely to be the last season in which a guaranteed price will be paid by the Government, it behoves every farmer in recommended or possibly suitable districts who has not yet tried the crop to make this trial now. No farmer can say exactly what can be done with cotton until he has actually tried it under his own conditions. During the boom period there were, unfortunately, many statements made that cotton returned growers £50 per acre net, and while this or anything like it is practically impossible, it is not intended to say what can be made from a normal or average crop. This must be determined by the farmer himself. Average yields or profit per acre are extremely misleading figures, for they tend to deter good farmers who would easily exceed them, and to disappoint the poorer farmers who do not reach them.

No one can tell better than the farmer himself how far a certain crop can be fitted into the economy of his farm practice, and those who have already grown cotton will no doubt be guided to a large extent by the price which has been guaranteed for next season's crop, which is as follows:—

Grades A and B—5¼d. per lb.
Grade C—5d. per lb.
Grade D—4¾d. per lb.
Grade E—4½d. per lb.
Grade F—4d. per lb.
Grade G—3½d. per lb.

No price has been guaranteed for ratoon cotton.

Supply of Cotton Seed.

The Department of Agriculture has arranged for cotton seed to be supplied by the British Australian Cotton Association, Limited, Queensland National Bank Chambers, Pitt and Hunter streets, Sydney. Application for seed should be made to the Secretary.

A charge of 1d. per lb. is being made to cover cost of postage, freight, bags., &c., with a minimum of 2s. 6d. Cash must accompany the order.

It is recommended that the seed be sown at the rate of from 15 to 20 lb. per acre.

It should be sown as early as possible after frosts, but the land must be warm. In the north coastal districts September is a suitable month for planting, but in colder districts October sowings are preferable.

Sow in well-prepared moist land in rows 4 feet to 4 feet 6 inches apart and two inches deep.

A leaflet containing further information in regard to cultivation, &c., may be obtained on application to the Department of Agriculture, Bridge-street, Sydney.

More detailed information as to cotton-growing in this State is given in Farmers' Bulletin No. 150: "The Cultivation of Cotton in New South Wales," price 10d., post free from the Government Printer, Phillip-street, Sydney.

Separate pamphlets dealing with insect pests and diseases of cotton are also available free from the Under Secretary and Director, Department of Agriculture, Sydney.

THE ILL-FED WORKING HORSE.

THERE is no other species of domestic animals in general as badly fed from a scientific standpoint as the common work horse. Despite the enormous waste products eliminated daily by a hard-worked horse, it must "carry on" with only water, one roughage, and one concentrate, given without thought of the constituent parts these feeds contain. Unfortunately, the work horse has nothing tangible like milk and eggs to measure against the cost of its rations.—*North American Veterinarian.*

Seed Maize Contest.

CENTRAL NEW ENGLAND, 1923-24.

G. C. SPARKS, Manager, and J. A. O'REILLY, Experimentalist, Glen Innes Experiment Farm.

THE first seed maize contest promoted by the Central New England Pastoral and Agricultural Association, Glen Innes, on lines similar to those conducted by several agricultural bodies in coastal and other districts, was carried out during the past season. Contests of this kind have for their object the determination of the best yielding varieties and strains of maize grown in a given district, and they aim also at the ultimate elimination of undesirable types.

The comparatively short maize-growing season of New England necessitates the cultivation of early-maturing sorts, and the entries for the contest in question consisted mainly of early varieties, the latest maturing entry being Iowa Silvermine. The entries in all totalled seventeen, including four non-competitive from the Department of Agriculture. The varieties were as follows:—

Goldmine (two strains), Silvermine (three strains), White Tip (three strains), Wellingrove (three strains), Funk's Yellow Dent (two strains), Golden Glow (one strain), Early Morn (one strain), White Champion (one strain), Goldmine X Wellingrove (one strain)

Some Details.

The competition was sown in triplicate in order to minimise risk of failure and to secure more comprehensive results, the following gentlemen placing land at the disposal of the association for the purpose:—

Dr. W. C. Blessing, "Indiana," Stonehenge.
Mr. V. Cornish, Tenterfield-road, Glen Innes.
Mr. Alex. Noble, "Fernhill," Glen Innes.

The soil at each centre was typical of the locality, the types covering heavy, light, and chocolate soils. Unfortunately, the sowing on Mr. Cornish's farm failed owing to extremely unfavourable weather conditions, but successful growth was made at the other two centres, the germination in each case being excellent.

The plots at "Fernhill" were on a black loam of basaltic origin which has been under cultivation for upwards of fifty years, and has at no time received any application of artificial manure. The land had been cropped to maize in 1921 and to oats in 1922. In preparation for the experiment the paddock was ploughed in August, 1923, and reploughed a fortnight prior to sowing. Planting was carried out on 12th October, 1923, in rows 4 feet apart, with single grains from 12 to 18 inches in the rows.

The " Indiana " plots were on chocolate soil of medium fertility, sod land, fallowed eight weeks prior to planting, which occurred on 15th October, 1924, in rows 46 inches apart, with three grains every 36 inches.

The effective rainfall was as follows —

1923.	Points.	1924.	Points.
October	133	January	254
November	73	February	716
December	447	March	89
		April	284

The spring and early summer months were extremely dry, but following the heavy precipitation of Christmas week eminently favourable weather was experienced, the autumn being described as the best for many years. Owing to the absence of early frost, even the latest varieties amongst those entered were able to reach full maturity.

The season may be regarded as somewhat abnormal and almost wholly favourable to late-maturing varieties. There has been a correlation between high yield and late maturity, and it could not be anticipated that the earlier maturing sorts could yield to comparative advantage in a season such as the past. Under normal conditions early maturity is one of the most important factors in maize culture in this district, and maize growers will be well advised to refrain from placing too much confidence in the later maturing varieties. The plots were harvested between 18th and 21st July, 1924.

RESULTS of Contest.

Competitor.	Variety.	"Fernhill."		"Indiana."		Average.	
		bus.	lb.	bus.	lb.	bus.	lb.
Theo Farlow	Goldmine	82	22	49	46	66	6
J. L. Campbell...	White Tip	79	36	51	42	65	39
Department of Agriculture ...	Funk's Yellow Dent	86	46	43	19	65	5
Department of Agriculture ...	Iowa Silvermine ...	82	43	47	8	64	54
Theo Farlow	Silvermine	75	44	52	33	64	11
H. Osborne	Funk's Yellow Dent	80	31	46	45	63	38
J. F. Chaffey	White Tip	81	17	44	13	62	43
H. P. Grob	White Champion ...	85	40	39	2	62	21
V. Cornish	Wellingrove X Goldmine	70	15	51	23	60	47
R. Campbell	Wellingrove	73	53	40	54	57	26
Department of Agriculture ...	Wellingrove	76	49	36	3	56	26
J. F. White	Shannon Vale ...	66	53	42	27	54	40
Geo. Smith	White Tip	69	9	38	1	53	33
W. J. Strong	Wellingrove type ...	62	30	40	17	51	24
O. F. Norton	Early Morn	56	36	34	50	45	43
Department of Agriculture ...	Golden Glow... ...	54	4	29	31	41	46
Jack Sharman	Goldmine	82	43	....		....	

These competitions are already of proven success in many of the leading maize-growing districts of the State, and the response to the initial effort in New England is most encouraging. The advisability of continuing the good work over several seasons may be strongly stressed.

Quite apart from the stimulation to the competitive instinct, the direct result of a competition of this kind is ultimately to identify not only the

highest yielding variety of maize for a given locality, but also to indicate the most desirable strain of that variety, and a concentration by growers upon this particular strain must result in maximum production in so far as the seed factor operates, and further also the development of greater uniformity of product. To attain maximum effect, however, these contests must persist over several seasons, in order to avoid the danger of conclusions that may be biassed by the abnormalities of relatively short periods.

Notes on the Varieties.

The winning entry of Goldmine was fairly typical of the variety, but displayed considerable room for improvement as regards type. The other entry of Goldmine was very true to type, but was unfortunately damaged by storm-water on the plots at "Indiana," and its yield is, therefore, not comparable. This is particularly to be deplored as, owing to the excellent showing made by this entry on the "Fernhill" plots, it is quite probable that it would have occupied a very high position in the averages.

The entries of White Tip were good, but the most attractive was that of Mr. G. Smith. The Wellingrove samples were good ones, the entry of Mr. W. J. Strong was an even sample, wide and fairly deep, and of darker colour than that of an ordinary type. Mr. R. Campbell's Wellingrove was slightly smaller than the former, but of better colour and very sound.

Mr. H. Osborne's entry of Funk's Yellow Dent was fairly typical, the grain being deep, narrow and pale coloured. Mr. O. F. Norton's Early Morn was very uniform; the grain was fairly small and shallow, and the sample an attractive one.

Mr. V. Cornish's Goldmine X Wellingrove was also an attractive sample, bright coloured and uniform in shape. Mr. J. F. White's Shannon Vale Silvermine was pinched, apparently frosted; the grain was soft and starchy. Mr. T. H. Farlow's Silvermine was not typical of the variety; the grain was fairly long, narrow, and uneven, and also slightly mixed.

Mr. H. P. Grob's White Champion was a sound sample, the grain being wide and fairly deep.

A small amount of fusarium rot was in evidence throughout the yellow varieties, but was not manifested in the white

Without These, No Co-Operation.

The man who knows what co-operation means thinks, talks, and acts co-operation every day of his life. He is always building up a greater confidence in co-operation among his friends and neighbours through support of every co-operative effort. He counsels patience when others only criticise. He offers suggestions in a spirit of sympathy when others merely denounce. He shows a desire to understand the difficulties of co-operation instead of being over-critical about details. There can be no co-operation without these three—patience, sympathy, and understanding.—*Michigan Potato Growers' Exchange.*

Selection of Seed Oats.

J. T. PRIDHAM, Plant Breeder.

In a previous issue attention has been called to the variation occurring in oat varieties, apart from the impurity due to mechanical mixing and failure to use clean machinery and bags.

These variations necessitate selection the same as for wheat. Instances are numerous of the value of continuous selection in a given district, whereby the variety becomes thoroughly suited to the local conditions of soil and climate. This must be so when the least promising individuals are sorted out and the most vigorous retained. We might refer to Genoa wheat and Guyra oats on Glen Innes Experiment Farm; to Cleveland wheat and Algerian oats at Bathurst; to Hard Federation and Lachlan oats at Cowra; to Firbank wheat and Sunrise oats to Nyngan and Condobolin Experiment Farms; and to Florence wheat and Sunrise oats at Coonamble.

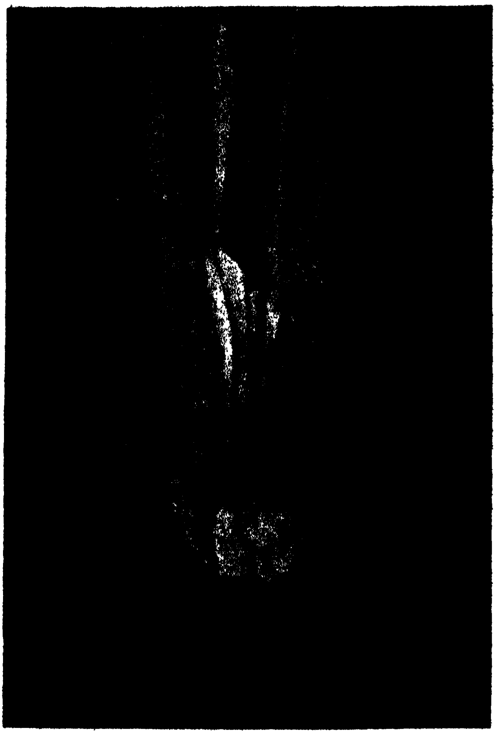
Base of Grain of Avena fatua.

When once a variety has demonstrated its suitability for a district, it is simply necessary to pull a few heads, or preferably single plants, from the crop and next year to sow them in individual rows or mixed in a bed, the former plan being the one we adopt. The following year the bulk of seed, which might be called "selected bulk," should be sown through one or two spouts of the seed drill, leaving one spout empty on either side. These long rows should be cut and threshed separately, by beating the sheaves in a bag with a stick. This grain could be sown the third year

as stud bulk, for the purpose of raising seed to sow the farm paddocks. By saving the three classes of seed each year, viz.:—

(1) Selected plants,
(2) Selected bulk,
(3) Stud bulk,

the grower will be maintaining the trueness of type of his seed oats, keeping the vigour of the crop up to a high standard, avoiding plant diseases and weed seeds, besides getting more keenly interested in his cropping, and therefore more successful.



Base of Grain of Avena sterilis.

In a good many crops may be seen the sports or variations likely to be met with in oats. Sunrise oats has a pale dun seed colour, nearly white, but the under side of the grain is dark dun. Variations range from yellowish white to black, including dark dun and several shades of brown. Some of the black seeds are hairy and some not. The wild oat seed is distinguished from the abberant forms of cultivated oats by its peculiar sucker or horseshoe attachment. Sometimes a grower is blamed for careless cultivation when the black oats in the sample are not the true wild oat, but a reversion from type of the variety sown. Similarly, Mulga oats, an offshoot from Sunrise, throws types varying from white to jet black, including browns, greys, or dun seeds. The colour of Mulga is a pale brown or creamy tint, with shades of dun on the ventral surface (opposite to the awn). A peculiar type met with has double husks, the outer one white and the inner black, but the horse-shoe attachment is wanting.

Lachlan oats are brown, like Algerian, but plumper and shorter. The departures from type range from straw colour to black, but are much fewer in number than in Sunrise and Mulga.

Algerian seems rather free from variation, though a few black seeds were found in the sample different from the wild oat.

When once variations are seen in a sample it is best to reject it for sale as pure seed. Attempts to hand-pick samples will not be successful; the only safe way is to "rogue" the stud bulk crop, removing by the roots any plants showing a variation from type. It is unlikely that departures from type will make their appearance until the seed has gone past the stud bulk seed into wider cultivation, but the plots should always be watched during the time from heading to harvest.

Base of Grain of Avena sativa.

For the enlarged figures showing the attachment of oat grains we are indebted to the courtesy of Sir George Knibbs, the Director of the Institute of Science and Industry, the blocks having appeared in Bulletin 23 of the Institute's series.

Outbreaks of Infectious Diseases Reported in August

The following outbreaks of the more important infectious diseases in the State of New South Wales have been reported during the month of August, 1924:—

Anthrax	Nil.
Contagious pneumonia of swine	Nil.
Pleuro-pneumonia contagiosa	2
Piroplasmosis (tick fever)	Nil.
Swine fever	Nil.

Max Henry, Chief Veterinary Surgeon.

If you are a dealer or purchaser of sheep, why should you risk inconvenience or loss through buying lice or tick infested sheep. When buying sheep off shears why not insist on dipping prior to taking delivery.

Farmers' Experiment Plots.

Sorghum Trials, 1924.

Upper North Coast District.

W. R. WATKINS, Agricultural Instructor.

Sorghum trials were carried out during the past season in co-operation with the following farmers:—

T. Hannah junr., "Cora Lynne," Lawrence, Clarence River.
M. McBaron, "Riverview," Raleigh, Bellinger River.

The season proved exceptionally good and lent itself in every way to good plant-growth on the Bellinger River, but was very different on the Clarence. On the Raleigh flats the rain was well distributed throughout the growing period, and the late winter was all in favour of good growth, the crop being harvested before the appearance of frost. In the case of the Lawrence flats, however, conditions were not nearly so favourable; the rainfall was patchy and, compared with Raleigh, very low. The registrations at Lawrence were: January (14th to 31st), 100 points; February, 279; March, 215; April, 174; May (to 16th), 165; total, 933 points. At Raleigh rain fell as follows:—December, 635 points; January, 293; February, 431; March, 694; April, 355; May (to 10th), 50; total, 2,458 points.

The Plots.

Lawrence.—Alluvial loam, previously cropped with wheat for green feed. Ploughed in October and left until December; harrowed and ploughed, then rolled and harrowed down for planting, the land being in good order. Planting was carried out on 14th January, using a maize dropper with sorghum plate attached; the seed was sown at the rate of 9 lb. per acre in drills 3 feet apart. Difficulty was experienced with the planting of Gooseneck, owing to the seed not running freely through the dropper.

Germination was good throughout, but a dry spell until the end of February kept the plants back, and it was not until March that the plots made any headway. By flowering time the plants showed a slightly stunted appearance and blight was prevalent, so the plots were harvested as soon as seed had set.

Early Amber Cane and Sorghum No. 34 were badly affected with blight; the other varieties were more or less affected, but not so seriously. Amber Cane also showed signs of red stain. White African gave the heaviest yield, with Saccaline (selected seed) second, and the ordinary Saccaline a close third. No. 61, Collier, and No. 34 also gave good results, but the last-mentioned showed a distinct weakness in the stem and lodged very badly. White African is a variety that is both juicy and sweet, with a fairly fine stalk; it was noticeably free from blight, rust, or stain.

A manurial trial was also carried out with ordinary Saccaline seed, but owing to the conditions prevailing this variety did not respond to the fertilisers used. The results were as follows:—

Fertiliser per acre.	Yield. t.	c.	q.	lb.
No manure	12	5	2	4
140 lb. superphosphate	10	14	0	12
210 lb. M 5	11	0	0	0
182 lb. M 13	10	6	1	0
No manure	12	1	2	12

M5 mixture consists of one part sulphate of ammonia and two of superphosphate. M13 consists of ten parts superphosphate and three of sulphate of potash.

The date of planting was the same as in the variety trial. Both plots were harvested on 16th May.

Raleigh.—As previously stated, the conditions here were good and consequently higher yields were obtained. The soil was alluvial loam inclined to be heavy, and had previously been cropped with maize. The land was ploughed three times (being very rough and lumpy owing to paspalum tufts), and disc-harrowed twice; then harrowed down for planting, which was carried out on 30th November, the ground still being in a fairly rough state. The maize-dropper, with sorghum plate attached, was used for planting, about 9 lb. seed being sown per acre in drills 3 feet apart with superphosphate at the rate of 168 lb. per acre.

Germination was good in all plots with the exception of Gooseneck, which, owing to the nature of the seed, would not run freely through the dropper. The falls of rain in December gave the plants a good start and showers in January and February kept them growing, but it was not till after the rains in March that the crop made exceptionally rapid growth. Harvesting took place on 16th May.

RESULTS of Variety Trials.

Variety.	Lawrence. t.	c.	q.	lb.	Raleigh. t	c.	q.	lb.
Saccaline (ordinary seed)	13	15	0	0	24	16	3	24
Saccaline (selected)	14	0	3	26	19	8	3	20
Early Amber Cane	9	6	2	12	....			
Sorghum No. 61	12	19	1	4	16	4	0	12
Collier	12	7	2	0	23	15	1	12
Orange	11	15	3	6	12	19	1	4
Sorghum No. 34	12	7	2	0	23	15	1	12
Bolong	10	18	0	4	8	12	3	12
White African	14	14	2	26	26	12	1	8
Gooseneck	11	11	3	14	16	4	0	12

Superphosphate at the rate of 168 lb per acre was applied to the Raleigh plots; no fertiliser was used on those at Lawrence

The Varieties.

Early Amber Cane.—A very early-maturing variety, but susceptible to red stain and an unsuitable variety for this district. In both plots this variety, although much earlier than the others, was affected by red stain and blight. It has a rather fine stalk, soft, but very watery and not very sweet.

No. 61.—Averaged 8 feet in height at Lawrence and 10½ feet at Raleigh. Fine stalk, fairly juicy and sweet, but inclined to be hard. Showed rust in both plots.

No. 34.—A tall-growing variety with a very fine stalk, rather weak and inclined to lodge. Very pithy and not very sweet.

Orange.—A new variety that is being tried, but is inclined to take red stain. It has a fine soft stalk; is fairly juicy and not very sweet.

Collier.—Another new variety, and one that is giving very good results, being juicy and sweet, and a clean grower, free from stain or rust.

White African.—A variety that is giving exceptionally good results, proving the best variety in both trial plots. It is a tall grower, with a fine to medium stalk, very juicy and sweet, and in both plots showed a distinct resistance to stain, rust, or blight.

Gooseneck.—Another tall-growing variety, rather coarse, not very juicy, but rather sweet. Showed a freedom from stain, but rusted fairly badly. A late-maturing variety.

Bolong.—Has not given any indication of doing well in the district, giving low yields in both plots. Has fine stalk, not very juicy or sweet, but soft. It is not a tall grower, but showed freedom from stain and rust.

Saccaline.—A comparative trial of selected and ordinary seed was carried out on each farm, the selected seed proving the better by a narrow margin on the Clarence and the ordinary seed giving the better results at Raleigh. This, however, cannot be regarded as a satisfactory test, as the selected seed was badly infested with weevils. This variety is about the only one grown to any extent throughout the district, and is very juicy and sweet.

White African proved the heaviest yielder on both plots, and it is undoubtedly a fine sorghum, combining good growth with sweetness and freedom from disease. It is also very juicy. It stood out in these trials on account of its health, clean growth, and there is every indication of it becoming a very popular variety. The best results are obtained by planting it fairly thick, otherwise it is inclined to become coarse and thickly stalked.

Another variety that is giving good results is Collier. This also is a tall grower, and shows a distinct freedom from disease. It is not quite as juicy perhaps as White African, but it is just as sweet. It is a little later in maturing.

Gooseneck, No. 61 and No. 34 were the other varieties that showed promise, and Gooseneck would have given better results had the seed enabled a more even planting. The last-named variety is a very tall grower, but the weak stalks and tendency to lodge prohibits its recommendation.

Bolong is another variety that has given poorer results, being short in growth and not very juicy or sweet.

The trial at Raleigh was the centre of interest to a number of the surrounding farmers, who were impressed by the showing of White African.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

MUCH interest was shown by farmers in the sorghum variety trials carried out by the Department in the Camden, Gerringong, and Dapto districts during the past season. Perhaps never before has such interest been manifested, probably on account of the usefulness of sorghum for supplying green fodder during the winter months, and also because of the search for varieties resistant to the red stain disease, which has proved so troublesome to those who grew the old varieties.

The following farmers co-operated with the Department in conducting the variety trials:—

J. W. Childs, Mount Hunter, Camden.
O. Sharp, Toolijooa, Gerringong.
L. Evans, Dapto.
J. R. Knapp, Bolong, Nowra.

The spring was dry, and much difficulty was experienced in getting the seed to germinate. Unfortunately, the plots sown on Mr. Knapp's property came up so unevenly that the experiment was declared a failure. The seed on this farm was sown with a wheat drill, which did not put the seed in deep enough, the ground being very dry at the time of sowing. On the other farms, the seed was sown with the single maize planter, using a ten-hole sorghum plate, and sowing about 4 or 5 lb. of seed per acre in drills about 3 feet apart. The wheel in front of the machine was removed in order to get the seed planted well down in any moisture there might be in the ground.

At Camden the soil had been worked down very fine, and there were some who thought the seed was planted too deeply, but the returns from these plots are so satisfactory that little fault can be found with the practice in a soil so dry as this.

On all farms a mixture consisting of equal parts of superphosphate and bonedust was applied, at the rate of 2 cwt. per acre, with the seed. It was noticed when sowing that the Gooseneck variety did not run well through the sowing plate, the seed being "fluffy," and poor stands were obtained on all plots. The seed varied in size, Orange and Bolong being the largest.

In regard to disease, Amber Cane—the earliest to mature on all plots—was so badly affected by red stain on one plot that no account was taken of it, and the comparatively poor yields from the other plots stamp it as an undesirable variety which should be discarded. There was much variation in the maturity of the varieties on all plots; the following order is that in which they matured:—Amber Cane, Sorghum No. 34, Orange, Bolong, Collier, White African, Sorghum No. 61, Gooseneck, and Saccaline. There was in one case nearly two months between the harvesting of the first and last sections.

The following notes might be of interest to sorghum growers:—

Amber Cane, to be discarded.

Sorghum No. 34, an excellent early variety, highly resistant to the red stain; heavy yielder; at Dapto it proved to be weak in the stem and lodged; worth trying.

Orange, large seed, good heads; inclined to become pithy; does not stand well as green fodder.

Bolong, large seed, heavy seeder, and inclined to lodge on that account; sweet; worthy of another trial.

Collier, a very fine variety; sweet; stands well into the winter, succulent; resistant to red stain; worth trying.

White African, a very sweet, succulent, heavy-yielding variety; rather late maturing, resistant to red stain; requires to be planted early to secure seed; seed white; worth trying.

Sorghum No. 61, a remarkable variety; will probably take the place of Saccaline; sweet, succulent, heavy yielder; resistant to red stain; matures rather earlier than Saccaline, and will stand longer into the winter months and resist frost better than Saccaline, this being the experience at Camden this winter. On 24th July, 1924, this variety was the most succulent of the varieties standing on the plot; Saccaline was refused by the cattle, while Sorghum No. 61 was greedily devoured when fed on the same day.

Gooseneck, a promising variety, very late maturing; very sweet, and resistant to red stain; it proved a prolific stooler under the thin seeding conditions; in the coming season's experiments means will be adopted to effect a proper seeding and secure a better trial.

Saccaline, a late variety, sweet and generally succulent; stands well into the winter in most districts; has taken the place of the old varieties of sorghum.

RESULTS of Sorghum Variety Trials.

	J. W. Childs, Camden.				O. Sharp, Gerringong.				L. Evans, Dapto.			
Planted .. .	20th November.				18th December.				22nd January.			
Harvested .. .	Earliest cut, 5th March. Last cut, 28th April.				Last cut, 31st May.				4th June.			
Rainfall	9 65 in				31·12 in.				. ...			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Orange	11	15	3	17	16	18	3	0	5	13	3	20
Bolong	15	17	1	25	18	18	3	8	9	12	0	0
Collier	19	16	3	4	22	15	3	18	11	7	3	12
White African	17	10	2	21	17	4	2	16	18	5	1	12
Amber Cane	6	17	2	0	nil.				5	6	0	18
Sorghum No. 34	11	17	2	0	13	3	3	0	14	10	2	4
Gooseneck	15	15	0	15	too thin seeding.				11	2	0	16
Sorghum No. 61	17	0	3	27	16	19	0	12	20	4	2	18
Saccaline	16	19	1	14	14	2	3	12	11	7	3	12

Drilling or Broadcasting.

Sorghum growers who practise broadcast sowing are advised to try a drilled plot alongside one broadcasted. During the past season quite a number have expressed their intention of "better farming," by drilling both sorghum and maize in future when sowing for green fodder. The use of superphosphate as a fertiliser has its decided advantages, as has been abundantly proved on the farmers' experiment plots.

IS SODIUM ARSENITE INJURIOUS TO SOILS?

THE question of possible injury to soils and to crop growth from the continued use of sodium arsenite used for weed destruction was investigated by the Hawiian Experiment Station in 1915, and as a result of these experiments it was ascertained that small quantities of arsenic stimulate plant growth, the crops tried being millet, buckwheat, and cowpea.

The most surprising feature of the investigation as reported in the *Journal of Agricultural Research*, Vol. V. p. 459, was the influence on ammonifying and nitrifying bacteria. In one type of soil, ammonification was stimulated even by such excessive amounts as 1 per cent. arsenious acid (As_2O_3) in the soil. The results as a whole indicated that no fear need be entertained regarding any detrimental influences toward the organisms upon which the plants rely for their nitrogen, provided proper soil texture is maintained. Furthermore, it was found that the arsenic practically loses its toxic influence towards plants, forming insoluble compounds with iron and aluminium.

To give a concrete example, land was sprayed for five years for weed destruction at the rate of three applications per year, using 5lb. arsenious acid (As_2O_3) per acre for each application. The surface 4 inches of soil was found to contain ·0092 per cent. arsenious acid, and none was present below that depth. Only ·00006 per cent. arsenious acid was soluble in water. Soils therefore possess strong fixing power for arsenic, and when a sodium arsenite spray is used for the destruction of weeds the arsenic will ultimately be deposited in the surface soil, there to remain in spite of the leaching effect of rains or irrigation.

Pot experiments carried out in this State some years ago support the above, and it appears reasonable to conclude that no injurious effect is likely to be produced on the soil from the application of arsenious acid in such quantities as is likely to be used commercially in the eradication of prickly-pear.—A. A. RAMSAY, Chemist.

A DUAL-PURPOSE SORGHUM.

DARSO is proving a useful dual-purpose sorghum, having sweet stems and producing a large quantity of grain which is valuable as feed for all classes of stock. Being an early maturer, it is suitable for districts with short summer seasons. At Glen Innes it yielded over 10 tons of green material, and in addition produced 48 bushels of grain per acre.—J. N. WHITTET, Agrostologist.

Hickory King Maize Contest.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

WITH the object of encouraging the growing of Hickory King maize (of which there is a distinct local shortage) for manufacture into cornflour, starch, &c., a contest was initiated by the Department in 1922, Messrs. Clifford Love and Co. Ltd., Sydney, offering prizes amounting to £10 10s. for the best yielding seed of this variety. A repetition of the competition was arranged for the season 1923-24, and the firm named repeated their offer of prize money. As the previous season had been one of the poorest maize seasons experienced for many years, many farmers had not a sufficiently good sample of seed to enter, and the contest only attracted seven entries. Sowings took place on three farms, as in the previous year, one each on the North Coast, Central Coast, and South Coast.

The North Coast plot was supervised by Mr. W. R. Watkins, Agricultural Instructor, and was sown on the farm of Mr. F. L. Playford, Nana Glen. The soil was second-class black alluvial loam, which had been growing maize consistently for the past nineteen years. The crop was sown on 22nd October, and the season was very dry until the end of December, when over 4 inches of rain fell, followed by 3 inches in January, over 6 inches in February, and 3½ inches in March. Good yields were therefore obtained.

The Central Coast plot was sown on 22nd November, on the farm of Mr. J. Campbell, Wingham, and was supervised by Mr. J. M. Pitt, Senior Agricultural Instructor.

The South Coast plot was supervised by Mr. R. N. Makin, Senior Agricultural Instructor, on the farm of Mr. C. Gibson, Dapto, and was sown on soil of sandstone formation on 6th November.

The yields of the samples on the different plots were as follow:—

Competitor.	North Coast.		Central Coast.		South Coast.		Average Yield.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
No. 1, Gordon Bros., Lochiel	70	0	60	36	48	10	59	34
No. 2, J. P. Rily, Cobargo	67	3	69	24	49	30	62	0
No. 3, R. C. Cole, Pambula	71	26	66	28	60	38	66	12
No. 4, J. McPherson, Pambula	61	9	57	40	44	25	54	25
No. 5, H. Cole, Pambula	70	40	67	54	62	24	67	2
No. 6, W. Cole, Pambula	76	35	66	28	56	18	66	24
No. 7 (unknown competitor)	73	38	65	2	73	16	70	37

Unfortunately, a sample (No. 7) of seed was received by the Department for this contest without any letter or mark of identification, and inquiries to date have not elicited the name of the unknown competitor.

The result of the contest is that the unknown competitor wins £3 3s. for the best average yield on the three plots, in addition to £2 2s. for the best yield on the South Coast plot, as well as the Department's certificate.

The other prizewinners are:—Mr. H. Cole, Pambula, £1 1s. for the second best average yield on the three plots; Mr. W. Cole, Pambula, £2 2s. for the best yield on the North Coast plot; Mr. J. P. Rily, Cobargo, £2 2s. for the best yield on the Central Coast plot.

Hickory King is particularly suited to second-class coastal lands, on which it is probably the best yielding variety known; and although white maize is generally quoted on the market a little lower than yellow, at present it is 2d. to 3d. per bushel more than yellow. Messrs. Clifford Love and Co. Ltd. have signified their willingness to buy Hickory King maize direct from the growers in these contests, paying for good quality Hickory King grain 3d. per bushel more than market quotations for yellow. As a matter of fact, offers have been made by the firm at a price almost 6d. in advance of the Sydney price for yellow maize at the present time.

The contest will be repeated this season. The donors of the prizes express the hope, however, that the number of entries will be appreciably increased. A slight alteration in the method of awarding the prize money will be adopted, 75 points being awarded for yield and 25 points for the value of the sample for manufacturing purposes as determined by the firm.

The Value of Change of Seed.

There is a notion, very prevalent among wheat-growers, to the effect that change of seed at periodical intervals is more or less necessary. It is very difficult to obtain, even from those who hold this view most stoutly, the reason for their belief. Perhaps the most obvious reason lies in the farmer's expressive phrase that the "wheat has run out." This is an expression of the belief that the continued cultivation of the same variety of wheat under the same soil conditions for a number of years results in the deterioration of that particular strain of seed to such an extent as to render a change absolutely imperative.

In other words, it is the practical farmer's expression of the belief that varieties of wheat, under ordinary conditions of cultivation, tend to degenerate. . . . It is difficult, indeed, to see how, if careless and slipshod methods of cultivation are practised, and no care taken to preserve the very best of the crop for the next season's seed, the prolificacy of any given variety of wheat can be maintained at a high level. It is still more difficult to see how such a grower can improve matters by securing a change of seed from persons as careless as himself. Unless the change be for the purpose of obtaining a better variety, or more vigorous seed, or seed that has been subjected to careful and continued systematic selection, there can be no advantage resulting from change of seed.—Dr. A. E. V. Richardson, in the *Journal* of the Department of Agriculture, Victoria.

Dairying Industry in New South Wales.

A Review of the Twelve Months, July, 1923, to June, 1924.

[Concluded from page 645.]

L. T. MacINNES, Dairy Expert.

It is difficult to arrive exactly at the percentage of choicest grade butter placed on the export and local markets.

All stored butter was of choicest grade, and by far the greater part of that sold locally and interstate was also choicest. As far as export is concerned it may be taken that of the amounts sent away during July, August, September, October, and December, 1923, and April, May, and June, 1924, nearly the whole was of either first or second grade, as production in those months was much below local requirements, and all the butter suitable for table use was consumed locally.

Taking the months of November, 1923, January, February, and March, 1924, during which there was an appreciable export surplus, we find that the total production was 31,702,108 lb. (there was no importation). The total exported was 7,280,150 lb., and the local trade would absorb some 20,500,000 lb., while the quantity stored for winter use was about 3,920,000 lb.

These figures show that, even at the peak-production period of the year, the local trade was four and one-third times greater than the export. They also demonstrate another very important fact in view of recent criticisms of the quality of our butter, viz., that the percentage of choicest grade out of the total manufactured during the four hottest months of the year (excluding December) was very high indeed.

The Commonwealth authorities put the percentage of choicest out of the total examined for export throughout the year at 44·6 per cent. Now, as nearly all the choicest that was examined must have been and presumably was exported during the four months November, January, February, and March, it follows that the percentage of choicest grade in the total examined for those months must have been considerably more than 44·6 per cent. As the Commonwealth officials have not dealt with the actual amounts exported, this presumption is subject to correction. It is desired in this review to be conservative in making estimates, and we may therefore take the quota of choicest export butter for those months at 45 per cent. The figures work out as follows:—

Total production	31,702,108 lb.	
Total exports	7,280,150 ,,	
45 per cent. of total exports	3,276,067 ,,	Choicest Grade.
Local trade	20,500,000 ,,	,, ,,
Winter stored butter	3,920,000 ,,	,, ,,
Total choicest	27,696,067 ,,	= 87·4 per cent.

This shows that the quantity of choicest butter produced during some of the worst manufacturing months of the year, and when production was at its peak, reached 87·4 per cent. Even allowing, as is only reasonable for a considerable portion of that placed on the local market not being up to choicest grade, though described on the packages as such, these figures prove that the art of manufacturing butter in New South Wales has reached a high standard. For every million pounds of inferior butter included in the portion of 20,500,000 lb. allocated for the local market, there would be a reduction of about 3 per cent. in the quantity of choicest grade produced. So if 20 per cent. of the butter originally branded choicest on the local market was under top quality (which the reports of the State graders, who check all the brands sold locally, do not bear out), about 75 per cent. of the summer production would still be of choicest quality. The official figures supplied by the factory managers under the provisions of the Dairy Industry Act for these four months are:—

November	86	per cent. Choicest Grade.
January	87	,, ,, ,,
February...	87	,, ,, ,,
March	89	,, ,, ,,

These, however, represent more the quality of the cream delivered at the factories. In manufacturing processes, and through adverse transit conditions, a portion of the butter packed under a choicest brand (in accordance with cream grading) would have deteriorated and would be re-graded.

The Position as Compared with Other States.

Of the quantities *examined* for export in the various States, we have the following:—

Victoria	67	per cent. Choicest.
New South Wales	44·6	,, ,,
Queensland	33	,, ,,

This comparison, however, is valueless for arriving at the quality of the total production of the various States, for the following reasons:—

1. No systematic method has so far been evolved by the Commonwealth authorities to ensure that the same standard of grading is put in practice at each shipping centre—Melbourne, Sydney, or Brisbane.

2. The exportable surplus as compared with the amounts required for the local trade of the several States varies considerably. Those States with the smaller local consumption would have a greater proportion of choicest to export. New South Wales local market takes 50 per cent. more than the Victorian and four times as much as the Queensland market.

3. As the New South Wales market, more than that of any other State, demands choicest grade, it follows that in a drought year, as was the one under review, there would be a very much smaller percentage of our high grade butter to export. This is supported by the fact that New South Wales did not produce enough choicest grade throughout the year to supply fully its own market.

The Value of the New South Wales Local Trade.

In arriving at the figure for local consumption, the Federal Statistician states that each unit of our population eats about 29 lb. butter per year. The present population of New South Wales is about 2¼ millions, so that for the next ten years on the average rate of increase for past years, New South Wales will consume the quantities of butter shown in the next little table. If increased immigr ation is successfully brought about, these figures must also be increased.

Year.	Population. (estimated).	Butter required at 29 lb. per head. lb.
1924	2,250,000	65,250,000
1929	3,346,000	97,034,000
1934	3,887,000	112,723,000

As production in New South Wales for the last twenty years has been practically stationary on an average of about 72,000,000 lb., it is apparent that unless the farming end is expanded considerably, this State will be a much larger importer in the near future. This will come about the more rapidly if our manufacture of textiles and other secondary industries is expanded, as it is expected it will be, in view of the amount of raw material, coal, hydro-electric power, &c., available, and in consideration of the high freights for overseas transport of raw material and the protective policy which has been adopted.

Table I shows the quantities produced for the last ten years, those exported each year and the percentage sold locally as well as that exported. The figures for the year 1921–22 show our record production since dairying was established, and indicate what our diary cows can do *if fed*. The production for 1923–24 is estimated for the month of June, as the exact quantities manufactured at each factory are not to hand for that month at time of writing.

TABLE I.—Production, Overseas Exports, Local Trade, 1914–1924.

Year.	Production.		Imports.	Total.	Overseas Exports. §	Per cent Exported	Per cent. Used Local Trade.	Approximate Ratio of Local Trade to Exports Overseas.
	Factory.	Farm.						
1914–15	80,328,902	3,805,378	.	84,134,280	23,784,838	28	72	2½ : 1
1915–16	55,372,557	4,258,986		59,631,543	4,305,927	7	93	13 : 1
1916–17	74,824,237	4,294,253	..	79,118,490	25,280,150	32	68	2⅛ : 1
1917–18	76,628,160	3,739,847	...	80,468,007	25,694,697	32	68	2⅛ : 1
1918–19	61,655,503	4,453,455	..	66,008,958	8,055,993	12	88	7⅓ : 1
1919–20	59,972,883	4,162,117	..	64,135,000	6,558,086	12	88	7⅓ : 1
1920–21	82,144,275	4,750,000	..	86,894,275	27,869,264	32	68	2⅛ : 1
1921–22	*95,328,608	5,348,973	3,500,000	104,172,581	36,493,624	35	65	2 : 1
1922–23	69,584,122	4,000,000	7,500,000	81,084,122	13,178,000	16	84	5¼ : 1
1923–24	†68,000,000	4,750,000	10,000,000	82,750,000	10,090,000	12	88	7⅓ : 1
Average 1914–24	72,374,424	4,356,300	‡7,000,000	76,739,725	18,130,058	21 6	78·4	3½ : 1

* Peak production. † Estimated. ‡ For last three years only. Portion of same re-exported balance used in loca trade. § Includes butter from other States and New Zealand that was re-exported to overseas destination.

It will be seen that on the average for the last ten years out of approximately every 4½ lb. butter produced only 1 lb. was exported overseas. That is, the local trade on the average is nearly four times as valuable as the export trade. During the year of peak production, 1921–22, one box was exported out of every three produced. Last year the ratio was one out of every seven produced, and the year before, 1922–23, it was one out of every eight. The ratio of export to production from 1906 to 1924 is shown in Table II. The ratio of export to local trade is shown in Table III, which is self-explanatory, and which indicates the increasingly strong position of the local trade.

TABLE II.—Ratio of Overseas Exports of Butter to Total Production, N.S.W.

Year.		lb.		lb.			
1906	exported ...	56	out of each	100	produced—roughly	1 in	2
1915	,, ...	28	,,	100	,, ,,	1 ,,	4
1916	,, ...	7	,,	100	,, ,,	1 ,,	14
1917	,, ...	32	,,	100	,, ,,	1 ,,	3
1918	,, ...	32	,,	100	,, ,,	1 ,,	3
1919	,, ...	12	,,	100	,, ,,	1 ,,	8
1920	,, ...	12	,,	100	,, ,,	1 ,,	8
1921	,, ...	32	,,	100	,, ,,	1 ,,	3
1922	,, ...	36	,,	100	,, ,,	1 ,,	3
1923	,, ...	13	,,	100	,, ,,	1 ,,	8
1924	,, ...	14	,,	100	,, ,,	1 ,,	7

TABLE III.—Ratio of Overseas Export to Local Trade Butter, N.S.W.

Year.		lb.		lb.
1906	for every ...	80	exported there was sold locally	100
1915	,, ...	39	,, ,, ,,	100
1916	,, ...	8	,, ,, ,,	100
1917	,, ...	47	,, ,, ,,	100
1918	,, ...	47	,, ,, ,,	100
1919	,, ...	13½	,, ,, ,,	100
1920	,, ...	13½	,, ,, ,,	100
1921	,, ...	47	,, ,, ,,	100
*1922	,, ...	54	,, ,, ,,	100
*1923	,, ...	19	,, ,, ,,	100
*1924	,, ...	14	,, ,, ,,	100

*Imports taken into account.

Particulars of Production, &c., 1921-1922.

A great deal has been said in certain quarters about the high percentage of exports for the year 1921–22 (the peak production year). This figure has been put elsewhere at 50 per cent.—some have said it was as high as 60 per cent. Table IV is herewith given to clear the matter up. The figures are tabulated for each month of the year, and show that the greatest export was reached in January, 1922, when 58 per cent. of the total produced was exported, but for the whole twelve months the total quantity exported was a shade under 35 per cent.

TABLE IV.—Butter Production and Distribution for year 1921–1922, year of Highest Production in N.S.W.

Year.	Production N.S.W. Factories.	Approximate Exports.	Per cent. Exported.
1921.	lb.	lb.	
July	3,927,173	358,725	...
August	4,122,954	358,725	...
September	5,446,281	358,725	...
October	8,604,933	3,100,000	36
November	10,152,059	4,650,000	46
December	10,322,445	4,800,000	46½
1922.			
January	13,101,476	7,600,000	58
February	11,667,304	6,100,000	52
March	11,788,573	6,250,000	53
April	7,523,632	2,000,000	26
May	5,283,513	358,725	...
June	3,383,265	358,725	...
Total production— Factories	95,323,608	36,493,624	Total exported overseas.
Farms	5,350,000	1,000,000	Approximate quantity stored summer 1922, sold locally July–September, 1922.
Imported	3,500,000	....	
Stored summer, 1921 (approx.)	2,000,000	68,679,984	Sold locally.
Total available	106,173,608	106,173,608	Total distributed.
Total production ...	... ...	100,673,608	
Imported	... ...	3,500,000	
Stored brought forward...	2,000,000		
Less Stored carried forward	1,000,000		
Total stored butter sold	... ...	1,000,000	
Total distributed ...	... ...	105,173,608 lb.	
Total exported	... ...	36,493,624 „	= 34·7 per cent.
Total sold locally ...	... ...	68,679,984 „	= 65·3 „

As such another uniformly good season can hardly be looked for, it would appear that 1921–22 may go down in history as the peak export year also.

Every year large quantities of butter are stored in Sydney, Newcastle, and other centres, to equalise winter supplies for consumers. In January, February, and March, 1922, some 1,000,000 lb. were stored for use in July to September, 1922, and within the period covered by Table IV, there was carried forward from the January-March, 1921, storage for sale in July-September, 1921, some 2,000,000 lb. So that the approximate total available for distribution in the year 1921–22 was 102,673,608 lb., apart from some

3,500,000 lb. imported from New Zealand and from the other States of Australia, some of which would be re-exported overseas. This total was disposed of as follows:—

	lb.
Local sales (including interstate)	*65,179,984
Export sales	36,493,624
Carried forward to year 1922-23	1,000,000
	102,673,608

* A large portion of the imported butter (3,500,000 lb.) should be added to this total

The foregoing tables and figures should satisfy critics of the value of the New South Wales local trade, and prepare all for the time when appreciable exports of butter from New South Wales may cease.

No account has been taken in the tables of the appreciable quantities of butter imported into New South Wales each year. Such importations would include that which was intended for re-export overseas, but which, being held in bond, would not appear in our export figures. There would also be included that which was to be sold and consumed within the State. If we are to arrive at a reasonably correct estimate of the amount of butter consumed locally in New South Wales, these importations must be added to that section of our own production used for local requirements.

The State Statistician has been good enough to make available a table of figures giving the *imports* of butter for the last three years up to 30th June, 1924. Those for the past twelve months equalled the total overseas exports from New South Wales.

IMPORTS of Butter to New South Wales.

Year ended June.	Imports into New South Wales.		
	Interstate (approximate).	Oversea.	Total.
	lb.	lb.	lb.
1922	2,946,076	521,801	3,467,877
1923	6,699,224	859,426	7,558,650
1924*	8,596,000	1,401,000	9,997,000

* Subject to revision.

From this table can be calculated further information—taking into account the quantities produced during each of the last three years.

PRODUCTION and Imports of Butter.

Year.	New South Wales Production.	Imported.	Total available for distribution.
	lb.	lb.	lb.
1921–22	100,672,000	3,467,877	104,139,877
1922–23	73,584,000	7,558,650	81,142,650
1923–24	72,750,000	9,997,000	82,747,000

DISTRIBUTION of Butter in New South Wales.

Year.	Total available for distribution.	Distribution.			
		Exported overseas		Local (including interstate) trade.	
		Quantity.	Per cent.	Quantity.	Per cent.
	lb.	lb.		lb.	
1921-22	104,139,877	36,493,624	35	67,646,253	65
1922-23	81,142,650	13,178,000	16	73,302,650	84
1923-24	82,747,000	10,080,000	12	72,667,000	88

The foregoing figures disclose the great inroads importers have made into a trade that a few years ago belonged almost entirely to our own State manufacturers. This expansion points out how suicidal it is to keep prices in New South Wales so far above those ruling in other neighbouring markets, including New Zealand, which sent us nearly 1½ million pounds of butter during last twelve months, mostly in the winter period. The amounts stored each season in New South Wales are not taken into the calculation, as it is difficult to arrive at these quantities exactly, and approximately that carried forward each season for the winter consumption does not vary greatly. The greatest variation was for the seasons 1921 and 1922. The months of July, August, September, 1921, saw a bigger consumption of stored butter than during the similar period 1922, on account of the latter season being so uniformly good that high production continued well into the winter of 1922.

The General Trade and Commercial Depression.

It is difficult to give a lucid and acceptable explanation of the fundamental reasons as to why Australia cannot get paid for the huge quantities of primary products exported to Great Britain other than by purchasing manufactured goods for importation to be sold against those we are manufacturing in Australia. It would seem that the great leaders of finance and the captains of industry and commerce (including shipping) in Great Britain are working in unison to find markets for Britain's own manufactured goods.

When an edifice is shaky from top to bottom the work of strengthening and repairing it must commence in the basement. The base of the present financial stress is found in the unsettled European situation. It is this that is causing England to fight to increase her exports here, thus finding work for her population. Therefore, Europe must be revived financially and industrially before we can expect relief from the present strong pressure to import more than we require.

In Australia, as in America, the aim is to do our own manufacturing. Australia is driven to do this by two great factors. First comes that of self-preservation; we must have greater population in order to have any chance of holding Australia as a Dominion for the white races. The more secondary

industry factories we establish, the greater becomes the consuming public, and in ratio to that increase the greater becomes the local market for our primary products. It follows that as our local consumption increases our exportable surplus must diminish, unless those who require our products in the overseas markets are prepared to pay for them in other than goods which we manufacture here. To do this, we are up against cost of transit—ships loaded only on the outward voyage from Australia to England must charge a higher freight on our primary exports than would be the case if they had full holds for both inward and outward voyages. To compensate for this extra charge there are the benefits derived from selling greater quantities on the local markets at not less than London prices.

The second great impelling force which is driving Australians to expand their secondary industries is the high cost of production in so far as our products derived from the land are concerned. If we have to sell a great part of those products in overseas markets at prices fixed in accord with the cheaper production and marketing costs ruling in other countries, it follows that our farmers cannot receive sufficient to meet the high costs of living and conducting their business that now rule in Australia. Therefore, every factory that manufactures dairy products is striving might and main to capture its full share and more of the local market.

New South Wales has the greatest market for primary products of any State in the Commonwealth and New Zealand, and Sydney takes by far the major portion in New South Wales. Hence it is clear why the Sydney market receives so much attention.

If New South Wales butter factories can manufacture 95 per cent. choicest grade butter, and can retain for themselves the whole trade of the State, which they should be able to do, it follows that with the increased consumption of whole milk that is striven for as far as this State is concerned, there should be no need to worry over the export markets. It is imperative, however, if this is to be done that the consumer receives every consideration and not only gets a uniformly high-grade food, be it milk, butter, or cheese, but that he gets it at the lowest price compatible with a payable return to the farmer. To do this the farmer must increase the yields of his cows and his acres on business lines—that is, such increases must not cost more than a certain percentage of the increased revenue. The factories must cut down manufacturing and transport costs, and combine into groups with one common brand for a standardised product, and the distributing end of the business must be reformed and marketing costs reduced to a minimum, while means of distribution are brought to the maximum of efficiency.

IN a country where special cabbage trains are run, and a passenger train may be shunted to let an egg train pass, "perishable produce"—uniformly crated, however, and consigned in bulk—gets the attention it deserves.—J. W. ROBERTSON SCOTT, in the *Scottish Journal of Agriculture*.

Western Grasses, Fodder Plants, and Fodder Trees.

Investigational Work in New South Wales.

J. N. WHITTET, H.D.A., Agrostologist.

Obviously the number of introduced fodder plants that will grow in our inland districts is limited, and consequently we look to native grasses, shrubs, herbs, and trees to meet the deficiencies.

Some of the best of our native grasses found in the drier parts of the State are Flinders (*Iseilema Mitchellii*), Curly Mitchell (*Astrebla triticoides*), Bull Mitchell (*Astrebla pectinata*), Hoop Mitchell (*Astrebla elymoides*), Queensland Blue (*Andropogon sericeus*), Brown Top or Sugar (*Erianthus fulvus*), Warrego Summer (*Panicum flavidum*), Coolah (*Panicum prolutum*), Native Millet (*Panicum decompositum*), Wallaby (*Danthonia* spp.), Native Oat (*Themeda avenacea*), Kangaroo (*Themeda Forskalii*), Early Spring (*Eriochloa polystachya* var.), Rare Blue (*Andropogon intermedius*), Satin Top (*Andropogon erianthoides*), and Star or Windmill (*Chloris acicularis, C. ventricosa,* and *C. truncata*).

Flinders grass is one of the most nutritive of our native grasses, and is relished by all classes of stock. It spreads freely from seed which germinates well.

Of Mitchell grasses, three are found in New South Wales, and of these Curly and Bull are the most palatable and nutritious. The stems and foliage of Hoop Mitchell are somewhat harsh, and consequently stock prefer the other two species. These grasses respond very rapidly to any rain that falls, and even when dry provide good feed for all classes of stock.

Queensland Blue is one of the best-known and easily recognised of all grasses, its fluffy head being very characteristic. This is an exceptionally good grass, and it should be allowed to seed periodically, as, unfortunately, through overstocking, it is becoming very scarce in western pastures.

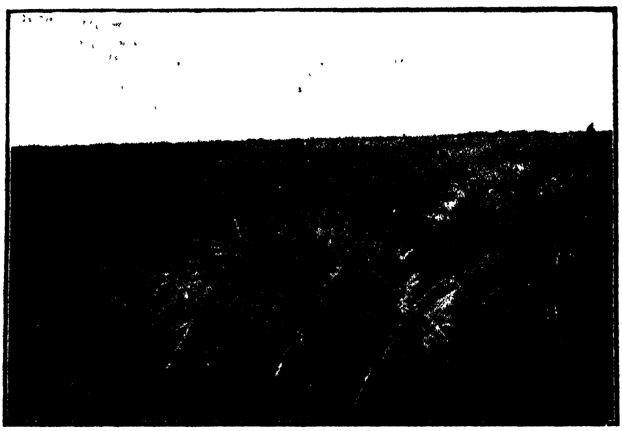
Brown Top or Sugar grass is another that can be readily detected when in head, its brown flowering spikes showing up and being very distinct from most other grasses. It is a very palatable and nutritious plant that is rapidly disappearing from our pasture areas.

Warrego Summer, Coolah, and Native Millet are three very hardy and very drought-resistant members of the Panic group. They seed freely, and are generally to be found in many pasture areas. Of the three, Native Millet is not as palatable to stock as the other two, but is very drought-resistant.

Wallaby grasses.—There are a large number of species of this group, which are generally referred to as white or silver-top grasses. Their short, white fluffy heads are very characteristic. These species provide feed mainly during winter months, and although not attaining any great size, they are excellent feed for all classes of stock, especially sheep. They are very nutritious, and exceptionally drought-resistant.

Native Oat and Kangaroo are rapidly disappearing from our pastures, due largely to overstocking and to their poor seeding qualites. Both are fairly nutritious summer grasses. Kangaroo is easily recognised by the reddish colour of its seed, stem, and flowers, while Native Oat forms a very strong seed stem, up to 5 feet in length, carrying large, dark oat-like seeds.

Two species of Early Spring grass are fairly common in the western districts of this State. They are very drought-resistant and form a good class of feed, especially for large stock. Sheep do not eat these grasses very freely, except in the young stages of growth and in a dry year.



Mitchell Grass on Nebea South Station, Coonamble.

Rare Blue and Satin Top have suffered considerably through overstocking, and also from the fact that their seed is very light and does not germinate readily. Both are very nutritious grasses.

Star or Windmill grasses are well known to all pastoralists. They do not grow to any great height, but are very plentiful in all sheep districts. They are nutritious, and not growing coarse are readily eaten by sheep and large stock.

A grass recently tried in the west is Giant Panic (*Panicum antidotale*). This species, on its behaviour during the dry spring and summer seasons of 1923 and 1924, gives promise of being one of the best drought-resisters we have ever had under investigation.

The majority of the above are spring and summer growers, but the dry plants provide a useful standby during the winter months. They are all good fattening grasses, and should be encouraged to seed occasionally in

order that they may be maintained in pastures for all time. If some provision is not made in this respect, the plants will be eaten out and worthless weeds will take their places.

The best plants in a pasture are naturally eaten back most continuously, and it only becomes a matter of time when they disappear altogether. We can find this undesirable feature forcibly demonstrated in many of our western pastures, the harsh, wiry grasses, such as numerous species of Spear (*Stipa* spp.), Three-awned Spear (*Aristida* spp.), and many others predominating at the present time.

In many parts of the western division of the State the autumn season of 1924 was the best the pastoralists had experienced for many years. Where paddocks had not been overstocked during the past four or five years the best native grasses, such as Flinders, Mitchells, Queensland Blue, &c., grew exceptionally well, being in some cases up to 4 feet in height and seeding profusely.

Early Spring Grass, Nebea South Station, Coonamble.

On the other hand, paddocks that had been overstocked were carrying large quantities of Spear grass, Caltrops or Yellow Vine (*Tribulus terrestris*), Russian Thistle or Roly Poly (*Salsola Kali*), Goat's Head (*Bassia bicornis*), Pig Weed (*Portulaca oleracea*), and many other plants of inferior value.

There are very few introduced grasses which will do well in the drier parts of the State. Four notable exceptions, however, are Rhodes (*Chloris gayana*), Sudan (*Andropogon sorghum* var. *sudanensis*), Weeping Love (*Eragrostis curvula*), and Texas (*Panicum bulbosum*). Rhodes grass should be sown for permanent pasture. Sudan, being an annual, is useful as temporary pasture, hay, or for silage.

An improved strain of Weeping Love grass (*Eragrostis curvula*) is proving very drought-resistant at Trangie Experiment Farm. It is a summer grower, and establishes itself well from self-sown seed.

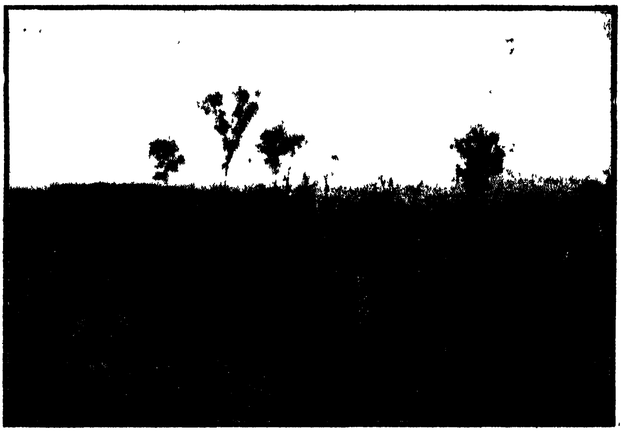
Texas grass (*Panicum bulbosum*) compares very favourably with other drought-resistant species of the Panic group.

Detrimental Grasses.

In this group we classify many of our Spear or Wire grasses (*Stipa* spp.), Three-awned Spear (*Aristida* spp.), and Burr (*Cenchrus* spp.). These plants are well known to pastoralists, as they cause considerable damage to sheep and their fleeces, and do not provide good feed.

Barley grass (*Hordeum murinum*), an introduction, provides good feed during the early stages of its growth, but when it comes into head and its seed ripens it causes considerable damage to the eyes and mouths of all classes of stock.

Stink grass (*Eragrostis major*), so named on account of the pungent odour it gives off, has lately been taking possession of cultivated and pas-



Giant Panic (*Panicum antidotale*) at Cowra Experiment Farm.

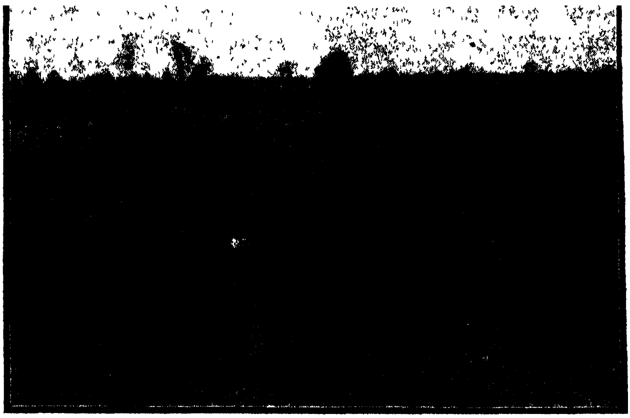
ture areas in many parts of the State. Its period of growth is very short, but, being a profuse seeder, it is becoming one of our worst "weed" grasses. This is also an introduced grass; stock do not care for it.

Some Excellent Native Pastures.

Some of the best native grass paddocks found in any part of the State for many years were seen during the autumn and early winter months of the present year in the Coonamble district. The most outstanding ones were those of Nebea South station, the property of Messrs. Ferguson Bros. Two paddocks situated in close proximity to the Baradine-road and about 9 miles from Coonamble (black soil areas), contained an excellent mixture of native grasses, as well as herbage and saltbushes.

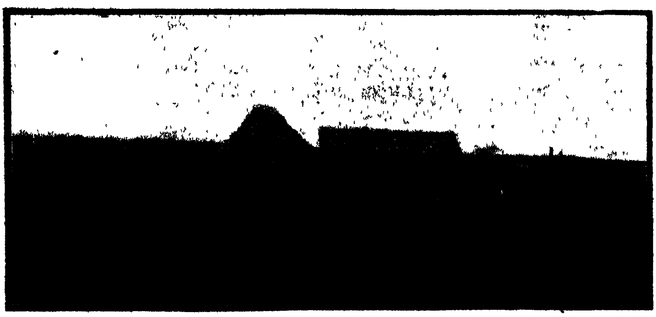
In one of the paddocks, of 1,200 acres, no fewer than twenty species of the best native grasses were collected, the predominating ones being the three species of Mitchell, in addition to Flinders, Queensland Blue, Brown

Top, Rare Blue, Coolah, Native Oat, Warrego Summer, three species of Wallaby grass, two species of Early Spring grass, three species of Star or Windmill grass, Native Millet, and Kangaroo. The area was practically devoid of any species of Spear grass. A paddock of 1,600 acres adjoining the one already mentioned, contained a similar covering, but if anything more Mitchell grass was present than in the 1,200-acre paddock.



Weeping Love Grass (*Eragrostis curvula*)—self sown plants on right—Trangie Experiment Farm.

A most striking object lesson in the matter of overstocking and its effect on grasses is shown in this district on the Coonamble commons. Here areas totalling several thousand acres that have been grazed heavily and continuously year in and year out for many years, are practically devoid of grasses. Odd plants of Spear grass (*Stipa scabra*) and Lindley's Sporobolus



Stacking Burr Clover Hay at Coonamble Experiment Farm.

(*Sporobolus Lindleyi*) are to be found. The area is covered with useless weeds such as Russian Thistle or Roly Poly (*Salsola Kali*), Caltrops or Yellow Vine (*Tribulus terrestris*), and Goat's Head (*Bassia bicornis*). A good deal of Pig Weed (*Portulaca oleracea*) is also present, though this plant is eaten by most classes of stock when feed is scarce.

The excellent paddocks on Nebea South have been judiciously stocked in the past, and even through the dry periods of 1922 and 1923 they carried a sheep to 2 acres. When the grasses came away well, after good rain in the latter part of 1923, the carrying capacity of the paddocks increased considerably, and from then on the areas were stocked at the rate of one sheep to the acre. Even when stocked at this rate, the grasses grew to a height of over 3 feet, and formed large quantities of seed. The overseer on this property considers Mitchell grass to be the best grass there, and he attributes the high prices obtained for fat wethers last autumn and winter to the best species of this grass.

Herbage.

Under this heading are included many plants, those of most value to the pastoralist being Trefoil or Burr clover (*Medicago denticulata*), Introduced crowfoot or Cranesbill (*Erodium cicutarium*), Native crowfoot (*Erodium cygnorum*), Musky crowfoot (*Erodium moschatum*), Spotted-leaved medic (*Medicago maculata*), Ball clover (*Trifolium glomeratum*), Hare's Foot trefoil (*Trifolium arvense*), and Woolly clover (*Trifolium tomentosum*).

Of the above, the most useful in providing large quantities of feed rapidly is Trefoil or Burr clover. Although the burrs are detrimental to wool, they are often the means of keeping sheep alive in seasons when other feed is lacking. The animals, in picking up the burrs from the ground, not only maintain their condition, but when the material is plentiful even fatten on it.

One of the main values of herbage is that it comes in at a time when the majority of our grasses are dormant, and when ewes require large quantities of green feed to maintain condition and a good flow of milk for their lambs. Although the large growth of herbage has, to some extent, contributed towards the crowding out of the more permanent pasture grasses, still, on the other hand, the views of many pastoralists are to the effect that stock will fatten more rapidly on herbage than on any other class of feed.

All the plants listed under the above heading are annuals with short periods of growth. Unfortunately, the herbage does not last as long as grasses do, and consequently the areas are likely to be bare for some months of the year after the herbage is gone.

The species of crowfoot are becoming widely distributed throughout the State, and being very bulky, provide large quantities of feed.

Spotted-leaved medic is a strong-growing plant, but is not nearly as widespread as the Burr clover.

Ball and Woolly clovers and Hare's Foot trefoil only last about six or seven weeks, but help to make up the bulk of feed generally spoken of as herbage.

Conservation of Herbage.

This work should be carried out in a good season, the material being converted into silage. Where paddocks are free of fallen timber, a mowing machine with swath-board attached would effectively cut the herbage and draw it into windrows. The work of carting and placing the cut material in a pit silo can be carried out at a very small cost. Burr clover cures into a good quality, nutritious hay.

Wilga Tree (*Geijera parviflora*).
Note how stock have trimmed the lower portions of the tree.

Saltbushes.

There are a number of saltbushes which provide feed in many districts of the State, but their greatest use is found in the far west. Those of most value to stockowners are referred to in the following paragraphs.

Old Man saltbush (*Atriplex nummularium*) grows to over 6 feet high in places, and provides large quantities of feed. Its large succulent leaves are greatly relished by stock. Propagation is effected by seeds, cuttings, or roots.

Bladder saltbush (*Atriplex vesicarium*) is a useful fodder plant that has become greatly diminished in pasture areas by overstocking. It forms a large quentity of seed, each seed having a bladder-like covering. Seed of this species should be collected and sown.

Slender-fruited saltbush (*Atriplex leptocarpum*) is very plentiful in most of the drier districts of the State, and although not attaining much size, provides good drought feed for stock, especially sheep. Although it forms large quantities of fruits, very few of them contain mature seed.

Creeping saltbush (*Atriplex semibaccatum*) is a more robust plant than *Atriplex leptocarpum,* and is fairly palatable to stock. Propagation is effected by means of seed.

Hastate-leaved saltbush (*Rhagodia hastata*), Nodding saltbush (*Rhagodia nutans*), and *Rhagodia linifolia* are characterised by their succulent fruits. They are all palatable and grow readily from seed. *Rhagodia spinescens* is also likely to prove a most useful species for the drier parts of the State. It forms a plentiful supply of seed which germinates very readily.

Fodder Trees.

In the far west stock invariably show preference for the better-known native fodder trees, as follows:—Kurrajong (*Brachychiton populneum*), Supple Jack (*Ventilago viminalis*), Rosewood (*Heterodendron olaefolium*), Myall (*Acacia pendula*), Mulga (*Acacia aneura*), Ironwood (*Acacia excelsa*), Whitewood (*Atalaya hemiglauca*), Wilga (*Geijera parviflora*), Leopard Tree (*Flindersia maculosa*), Colane (*Owenia acidula*), and Warrior or Currant Bush (*Apophyllum anomalum*).

Through rough usage at lopping time many of our fodder treees are dying out. Care should be taken to preserve established trees, and wherever possible to plant the species which do best in the district.

Two Valuable Grasses.

THE most outstanding features in the pasture feeding-off trials have been the carrying capacity of Toowoomba Canary (*Phalaris bulbosa*) and Kikuyu (*Pennisetum clandestinum*) grasses and their ability to respond rapidly to any rain that falls. At Glen Innes, Guyra, Stonehenge, and on many parts of the coast, Toowoomba Canary as a winter grass has proved superior to natural pastures by over 100 per cent. in regard to carrying capacity. Similar remarks apply in coastal districts to the summer growth of Kikuyu grass.—J. N WHITTET, Agrostologist.

Parasites of the Skin of Sheep.

H. G. BELSCHNER, B.V.Sc., Government Veterinary Surgeon.

I.—THE SHEEP "TICK" (*Melophagus ovinus*, Linn.).

THE sheep "tick" is not a true tick in the zoological sense. It is a wingless fly belonging to the order *Diptera* and family *Hippoboscidæ*, a reddish or greyish-brown insect, about ¼ of inch long, covered with short spines, and having a small head sunken into the thorax, and a large sac-like abdomen. It has six stout legs terminated by strong claws. The antennæ are inserted into pits near the mouth, and the mouth parts are adapted for piercing and sucking blood. The "tick" almost buries its head and proboscis in the skin, and once fixed hangs on for weeks. It is nimble and active, and migrates readily to another animal of the same species when disturbed.

Life History.

The sheep "tick," unlike the true tick, spends the whole of its life upon the one host, which it never leaves unless to attach itself to another sheep. This migration occurs principally at shearing time, when the ticks leave the shorn sheep and crawl upon the lambs. The female brings forth its young as nearly fully-developed larvæ, which, when deposited into the wool of the host, are covered with a soft white membrane. In about twelve hours this membrane becomes brown and hard, and the pupal stage is reached.

These reddish-brown pupæ, which are really cases containing embryo ticks, are attached to the wool fibres by a sticky substance extruded by the female. It is these hard pupæ that frequently escape the destructive action of dipping fluids. The young ticks emerge from the pupal stage in from nineteen to twenty-four days, according to season and temperature, and immediately commence to work their way through the wool and attach themselves to the skin of the sheep.

Recent experiments carred out by Hill in Victoria have shown that young female ticks are capable of copulating five days after their emergence from the pupæ. The young female extrudes the first pupa in a minimum period of thirteen days after her emergence from the pupa. The usual period is, however, longer—up to twenty-three days.

The number of pupæ laid by an individual female depends upon the length of her life. The life of the "tick" probably does not exceed four or five months, and the number of pupæ laid is about ten to twelve.

The length of time the ticks remain alive off their host is an important question, and one frequently discussed among sheep men. American and European investigators have shown that the sheep ticks cannot live many days apart from their host, and that when off the sheep they die in from two to eight days, most of them dying in about four days. In view of the importance of the question and the probable variation under Australian conditions, Drs. Sweet and Seddon carried out some experiments in this

connection in Victoria in 1916, and G. F. Hill confirmed and further extended these experiments in 1917. These experiments showed that the period of viability of the sheep tick when removed from the host and kept without food is longer under Australian conditions than has been recognised elsewhere. Sweet and Seddon showed that ticks could be kept alive off the host in Victoria for eleven and three-quarter days under cool, uniform conditions in early summer, while Hill showed that even this period may be exceeded, he having kept an adult female tick alive in a cellar for eighteen days. "Under more natural outside conditions the maximum time of survival was for adult ticks eleven days. The adult tick lives longer apart from the host than does the young insect. Experiments carried out to determine the viability of the pupa when removed from the host showed that, excepting under the influence of extremes of temperature, a certain proportion of the pupæ are viable for varying periods up to forty-two days after removal from the host." Hill further remarks that "the above experiments and observations show that there is some slight ground for the contentions of those sheepowners who maintain that sheep previously freed of ticks by dipping may become reinfected with other ticks which have been left on grass, bushes, and posts, &c., or with young ticks which have emerged from pupæ dislodged from the fleeces of infected sheep. No records are available of ticks or their pupæ having been found under such circumstances (except on the shearing-board), although the transference of the adult insects from the fleece to bushes, posts, logs, &c., appears to be quite probable in view of the habit of these insects in coming to the surface of the fleece in warm weather. It is likely also that a few pupæ are dislodged while the sheep is rubbing against logs, fences, &c., and others may be washed out of the fleece with heavy rain, or drop to the ground as a result of the dipping fluid.

"Even under favourable conditions, however, the number of ticks which survive for more than four or five days off the host and subsequently reinfect clean sheep must be extremely small, much too small to account for a general reinfestation of a clean flock, or even a fair number of the sheep. While a certain amount of reinfection is not only possible but very probable, most of the parasites found on previously dipped sheep are the progeny of pupæ extruded prior to dipping, and which have escaped the destructive action of the fluid."

This opinion of Hill is borne out by the writer's own experience.

Occurrence.

The sheep louse-fly or sheep tick may be found on sheep at all times of the year. They are well distributed over the State, but are not found to any great extent in the far west of the State. It would appear that the extreme heat and dryness of the west are unfavourable to the parasite.

Ticks are particularly noticeable at shearing time, when many are destroyed during shearing and others are carried away in the wool and perish. Their food consists wholly of the blood which they suck from the sheep. All breeds of sheep are subject to attack.

Effect.

The injury to the sheep caused by the presence of these parasites depends upon the number present. It will be seen from the life history of the sheep tick that owing to the fact that the ticks are fully matured in five days after their emergence from the pupæ, and that the female after copulation may deposit its first pupa in eight to ten days, a sheep lightly infested becomes in the course of a few months heavily infested. Sheep are not greatly affected by a few of the parasites, but if in larger numbers their presence will be indicated by scratching, rubbing, and biting at the fleece. Loss of flesh and general unthriftness will occur through the intense irritation set up. This is particularly noticeable in lambs, as the skin is tender and the number of parasites attacking them after shearing is unusually large. The damage done to the wool is also considerable, and the growth and character of the wool is affected if the sheep is unthrifty.

Treatment.

Various proprietary dips are employed to rid the sheep of these parasites, including the coal-tar, creosote and cresol preparations, and the lime-sulphur-arsenic dips. Most of them are effective if the dipping is carried out properly. Sheep are best dipped one month to six weeks after shearing, observing the usual precautions as regards handling the sheep and not dipping while sheep are thirsty, &c.

Sheep may also be sprayed, and special sheep may be hand-treated by blowing pyrethrum powder deep into and upon the fleece all over the body. The best treatment, however, is to thoroughly dip the sheep with one of the well recommended dips. None of the dips will kill all the pupæ, and keeping in mind the life history of the parasite, the treatment should be repeated in twenty-four days. It has been found, however, that if all sheep are carefully and properly dipped once a year, they can be kept free from ticks. A dip that adheres well to the wool with good lasting effects should be used, and for this reason an arsenical dip is probably the best.

Prevention.

Clean sheep can only become infected by coming in contact with infested sheep, or by picking up recently-dropped ticks or pupæ in their wool from fences, logs, &c., or the shearing-board and yards. All enclosures such as shearing-sheds, yards, &c., that have been occupied by tick-infested sheep should be regarded as dangerous for a period of at least six weeks, as the pupæ may retain their vitality under certain conditions for this length of time. Most of the pupæ remain in the wool, but a certain percentage may be rubbed off in the yards and sheds, and young ticks hatching from such pupæ may afterwards get on sheep. Clean sheep must be kept away from contact with "ticky" sheep, and the possibility of goats conveying ticks to sheep must not be overlooked. Shearers and shed hands sometimes carry ticks for a short time in their clothing, and this should be kept in mind at shearing time.

If clean sheep are to be brought into enclosures recently occupied by "ticky" sheep, a strong solution of coal-tar dip should be freely used around the sides of the pens, yards, and on the shearing-board. This cannot be relied upon to kill the pupæ, but it is useful in killing recently-hatched ticks. In addition, all enclosures should be cleaned up and litter and manure disposed of. Shearing removes a great number of ticks, and care should be taken that lambs are kept well away from the shearing-board.

II.—THE BITING LOUSE (*Trichodectes sphaerocephalus*).

Several species of lice are parasitic upon the skin of sheep in New South Wales, but of these the most common one is the biting louse (*Trichodectes sphaerocephalus*). This is a small, wingless insect, so small that many people require a magnifying glass to see it. The general colour is white, but the head and thorax are darker in colour. The head is broader than the thorax, and has the mouth parts adapted for biting and sucking. The abdomen is elliptical and divided into segments, each segment having a median band of a dark colour. It is usually found close to the skin, which it bites through to obtain nourishment, thereby causing considerable irritation. It is a very active louse, and moves rapidly among the wool fibres. The male louse is about one-twentieth of an inch long, and the female slightly longer.

Life History.

Like the sheep "tick," the louse spends the whole of its life upon the host, and does not leave it unless to transfer to another animal, which it can do very rapidly when sheep are in contact with one another. Eggs are deposited by the female, and are referred to as "nits." They may be seen by the aid of a hand magnifying-glass, and have somewhat the shape of a barrel. They are attached to the wool by a viscid substance extruded by the female. The eggs are said to hatch out in five to ten days, the longer period being in cold weather. The young lice resemble the adult, excepting in size, and are almost invisible to the naked eye. It is owing to the extreme smallness of the nits and young lice that sheep fairly heavily infested may to an ordinary observer appear clean, unless, of course, there is evidence of rubbing on the fleece, caused by the irritation set up. The young lice are said to become mature and to begin laying eggs in the course of about two weeks after hatching. They are very prolific and hardy.

Occurrence.

The biting lice are found almost all over the State, and, unlike the sheep tick, are to be found infesting sheep in the far west. Lice seem to prefer crossbred sheep, probably on account of the wool being more open. The writer has, however, from his own observations, found Merino sheep very susceptible, particularly the coarser and more open-woolled Merinos. The lice lie deep in the wool, close to the body, and their small size and hard, flattened bodies facilitate their movements among the wool fibres. It is

to ensure the dip reaching the parasite that thorough saturation of the fleece is necessary when dipping. The biting lice are not localised to any particular part of the body.

When examining for lice, the inspection should be carried right down to the skin, and the wool opened, preferably in the direct sunlight. A small magnifying-glass greatly assists detection of the parasites.

Effect.

The effect of lice on sheep is well known. The intense irritation set up by the parasite causes the sheep to rub itself against logs, fences, &c., and thus considerable damage is done to the fleece. The sheep becomes unthrifty, the wool loses its character and brightness, and it is also believed that the lice cut the wool fibres with their mandibles, thereby seriously altering the fleece.

Any difficulty in recognising the presence of lice in sheep is usually confined to the earlier stages of their attack. The writer has seen Merino sheep lightly infested at one shearing come into the shed the following year so badly infested that when the fleeces were examined on the wool-table they were found to be literally swarming with lice. In addition, the whole character of the wool was altered. The reduced value of the clip can be imagined. These sheep had not been dipped.

When badly attacked the sheep bites at the affected parts of the body within reach. It also scratches at the affected parts with the hind legs. The loss of nervous energy and the interference with feeding and nutrition tend to stunt the growth of young animals and cause older sheep to become unthrifty, thus seriously interfering with the growth of wool and fattening of the animal.

Lice are more prolific and detrimental than ticks, and are becoming a serious menace to the wool industry. A few lousy sheep may infest a whole flock. It is not uncommon to see badly infested sheep with large areas of wool rubbed off, and actual sores are sometimes caused where numerous biting lice cluster together.

Treatment.

Although, as mentioned above, the damage done by sheep lice is very extensive, this menace can be readily overcome by correct dipping.

Thorough dipping four to eight weeks off shears with one of the well recognised commercial poisonous dips, preferably an arsenical dip, is the only effective cure for lice. The dipping must, however, be carried out thoroughly, care being taken that the sheep are soaked to the skin. Much of the trouble of reinfestation later is due to the lack of proper saturation of the fleece in the first place. It is a distinct advantage to dip twice, with an interval of fourteen to sixteen days between dippings, in order to kill the lice that hatch out after dipping, since these dips cannot be depended upon to kill all the eggs or nits.

As with sheep "ticks," it has been found that if sheep are thoroughly dipped with one of the poisonous powder dips and if it be one that adheres well to the wool, sheep can generally be kept clean from shearing to shearing. There appears to be sufficient of the poison from the dip left in the fleece to destroy the young delicate lice when they hatch out.

If sheep are badly infested they should be dipped about fourteen days off shears, when the cuts have healed up, and then again at the end of six weeks to two months. Regular dipping every year will do away with this necessity.

Prevention.

It is essential that contact with lousy sheep be avoided, and that clean sheep be kept out of sheds and enclosures, and even out of paddocks, where lousy sheep have been within three weeks. The remarks in connection with the cleaning of sheds and yards recently occupied by tick-infested sheep also apply here.

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GREEN MAIZE AS FEED FOR POULTRY.

THE risk of prussic acid poisoning, which is sometimes alleged to attend the use of green maize as feed for poultry, was a subject upon which a recent inquiry elicited the following statement from the Chemist, Mr. A. A. Ramsay:—

"So far as I am aware, the presence of a cyanogenetic glucoside in maize was not suspected prior to 1902. Investigations made since that date indicate that such a glucoside is present in small amounts, which increase up to the flowering stage, and decrease rapidly as soon as the cob begins to form, but the actual quantity does not become dangerous in ordinary circumstances.

"With regard to the feeding of green maize to poultry, I am of opinion that the likelihood of injury from hydrocyanic acid poisoning is very small indeed, and is probably negligible. More especially will this be so if fed as part of a balanced ration, and in moderation, for the cyanogenetic glucosides are easily decomposed, and the action of hydrocyanic acid is inhibited by the presence of quite a number of substances—for example, sugar, cellulose meal, and even dry fibre. In this connection it should be noted that the Poultry Expert recommends in his book, 'Poultry Farming in New South Wales,' that green feed should be used merely as an adjunct, to be taken in small amounts and not in bulky quantities, as nature has not equipped poultry with the capacity for dealing with green feed in sufficient quantity to sustain life and to produce large numbers of such a concentrated product as an egg."

"I am of opinion," said Mr. J. Hadlington, Poultry Expert, "that the only trouble likely to arise from feeding green maize is from the fibre content in samples of advanced growth."

Farmers' Experiment Plots.

Vegetable Trials, 1923.

Lower North Coast.

J. M. PITT, Senior Agricultural Instructor.

Trials with vegetable crops were conducted during the autumn and spring in conjunction with the following:—

R. Dyball, Taree Estate, Manning River.
F. Waters, East Kempsey, Macleay River.
W. J. Seargent, East Fredrickton, Macleay River.

With the exception of the last named these farmers rely largely on market gardening for a livelihood. Their farms are ideally situated for the purpose, being within a stone's throw of the two most thickly populated towns on the "Lower Rivers." The soil is regarded as among the richest alluvial land on the respective rivers. In capable hands and under such favourable conditions market gardening is a profitable occupation.

There is always a ready sale for well-grown, clean, freshly delivered vegetables in these towns, and vegetable growing might well be substituted on many of the small areas in the immediate neighbourhood for the less profitable maize—a crop which could well be left to the larger farms further afield. This applies more to the Macleay than to the Manning district. In many ways vegetable growing has advanced in a more marked degree on the latter river than on the Macleay. Taree, the chief town on the Manning, owing to its rather poor soil, has to depend largely upon the rich alluvial farms surrounding for its vegetable supplies—the town being well served by greengrocers and two vegetable marts. On the other hand, Kempsey—the Macleay's chief centre—is more independent. Most of the town is built on rich, alluvial soil, which, together with a good water supply, allows the townspeople to grow at least some of their vegetables.

Experimental work has advanced to a marked degree with the Manning vegetable grower, and these men have not been slow to learn that many of the older varieties of vegetables have had to make way for newer and more profitable sorts. Greenfeast pea, for instance, first came into prominence as the result of trials conducted at Taree Estate some few years back. Then practically unknown, it is now probably the most widely-grown variety in the State. The demand for experiment work is growing on the Macleay, and it will not be long before growers here will also recognise that the older sorts must make way for more profitable varieties, just as has already been done with maize—chiefly through the popularity of the competition and experiment plots.

The Season.

On the Manning the autumn months were favoured by good rainfalls. May and June were somewhat dry, but good rain was again registered in August. The spring months, however, were very dry and droughty right through to Christmas.

On the Macleay the autumn, winter, and early spring months were moderately good. Thunderstorms during late spring helped the crops considerably. The drought was broken about Christmas time.

The Pea Crops.

This valuable crop is not sown as extensively on the Macleay as it might be. Other than small patches for home use, the crop is limited to areas a little larger, sown by a few men interested in market gardening, Yorkshire Hero playing the most prominent part.

On the Manning fairly extensive areas are sown, there being a big local demand for peas and a considerable quantity being marketed in surrounding towns and in Newcastle. The early autumn (February), late autumn (May), and further smaller sowings in August and September are the main sowings.

Greenfeast is now universally sown, with smaller areas under American Wonder and Yorkshire Hero, but farmers find it is difficult to get a market for any other than the "Wonder" type.

On the Macleay, at East Kempsey the varieties tried were Stratagem, Greenfeast, William Hurst, Hundredfold, Daisy, Senator, Union Jack, Improved Magnet, Peacemaker, and Yorkshire Hero. Practically only Yorkshire Hero and Stratagem had been sown on the farm previously. Owing to the attacks of caterpillars no weights were kept. Improved Magnet, Greenfeast, Peacemaker, and William Hurst showed most promise. The plot was sown on fairly heavy loamy soil, previously cropped to maize. It was ploughed twice and sown on 13th June. The experiment is to be continued.

At East Fredrickton the plot was sown on a lighter loamy soil on 24th May. The varieties tried were, Hundredfold, Utility, Greenfeast, Peacemaker, Senator, Yorkshire Hero, Bountiful, Richard Seddon, and Improved Magnet. Owing to the later varieties running into a better season they did best. Caterpillars did considerable damage. Yorkshire Hero and Peacemaker were the best.

On the Manning at Taree Estate, the plot was sown on heavy loamy soil on 21st July. The varieties tried were Greenfeast, William Hurst, Senator, Hundredfold, Richard Seddon, Yorkshire Hero, Telephone, Duke Albany, and Utility. The previous crop had been tomatoes. The land was disc ploughed twice and harrowed three times. No weights were kept owing to the crop being damaged by caterpillars. Greenfeast was easily the best; whilst Hundredfold, Utility, Duke Albany, and Richard Seddon were the next most promising.

It is worthy of mention that although Greenfeast has undoubtedly out-yielded all other varieties during the past few years where the soil is inclined towards a heavy clay loam or clay, this superiority is not quite so pronounced on the sandy or light loamy soils. Another fact worth noting is that a scarcity of seed, brought about by the rapid advancement of the variety, has led to some undesirable seed being broadcasted. By the establishment of pure seed plots this fault, it is hoped, will probably in time be remedied.

Onion Trials.

Onions on the Macleay River are practically neglected as a commercia or even home garden crop, although the commodity (imported from other districts) is in demand in practically every household. The chief reasons for this seem to be that varieties with good keeping qualities are difficult to produce, the crop requires a certain amount of hand cultivation, and onions are nearly always procurable from the shops at a reasonable price. There are undoubted opportunities nevertheless for onion-growing on the Macleay. The bulbs produced on the experiment plot at East Kempsey were an eye-opener to many, both for size and quality. Although the Odourless variety yielded heaviest, the size of the tubers—many exceeded a pound in weight—were too large for bunching, the most popular method of marketing. This fault (if it can be called a fault) can, however, be remedied by planting out thicker or else choosing a soil less fertile. Ailsa Craig and Prizetaker were the popular sorts, the tubers being remarkably even and clean and tender. Their keeping qualities were better than those of either Odourless or Barletta and they yielded well. Hunter River Brown Spanish ran to seed early—rather a common occurrence with this variety on the Central Coast. With the exception of the last mentioned, all the varieties were comparatively new to the disrtict.

The seed was sown in April and the young plants set out in drills 2 feet apart in July, in a well prepared new piece of land. The yields were as follows :—

	tons.	cwt.
Odourless	10	0
Prizetaker	8	16
Ailsa Craig	7	17
E. Barletta	7	2
Hunter River Brown Spanish	5	16
Long Keeping Brown Spanish	4	14

The East Fredrickson plot was not weighed—the farm changing hands.

On the Manning onions are rather more popular than on the sister river; still there is ample scope for greater production. Several farmers regard onions as being more profitable than the potato, and grow a plot annually.

The plots at Taree Estate were attacked by mildew and no weights were kept owing to some of the varieties failing to mature their bulbs. Quite

the outstanding feature of the trial was the continued success of the variety Pera, a Departmental find. Although slightly mildewed every bulb matured. This variety is a light brown skinned onion of excellent quality, even in shape and size, and above all is a splendid keeper, which fact is sure to make it a popular variety in coastal districts.

Tomato Trials.

Tomatoes are grown extensively on the Manning, both the early and late crops paying farmers handsomely. Earliana, Matchless, Burwood Prize, and Ponderosa are the varieties most fancied, but many other varieties are tried, all claimed by their respective growers to be the best. Although Earliana is probably the most widely grown, it has its failings, the chief one being that the sparseness of foliage results in the fruit becoming badly scalded in the summer months; nor does it crop heavily enough for some growers. It is hoped that by a continuation of the trials a variety more suitable will be discovered.

Fourteen varieties comprised the experiment, and the following notes were collected :—

Harbinger.—First fruit ripens about the same as Earliana. Carries more foliage and of an upright nature. A good cropper.

Landrith's Early.—First fruit ripens about the same as Earliana. Plants dwarf and sparsely foliaged. A heavy cropper.

Burwood Prize.—Matures fruit a little later than the above. Rather a heavy foliage. First setting fruit sparse. Good quantity.

Golden Queen.—Slightly more foliage than Earliana. Fruit small. Matures same time as Burwood Prize.

Walker's Recruit.—Carries a fair amount of foliage. Fruit fairly plentiful borne in clusters, but mostly medium to small.

Red Trophy.—Foliage a little denser than that of Harbinger; plant grows more erect. Fruit fairly plentiful, although not so prolific as Earliana, nor is it quite as early.

Dwarf Giant.—Foliage dwarfish, thick and somewhat like a potato growth. Very late and somewhat shy bearer.

Buckeye State.—Although it carries no more foliage than Earliana, this variety showed promise, and will be grown again. It bears rather well, fruit even in shape, mostly about the same size. Slightly later than Earliana.

Stone.—A fairly good sort. Carries more foliage than Earliana; taller growing, good fruiter, mostly medium to late.

The Mikado.—Somewhat similar to Burwood Prize, carrying a little less foliage, but more trailing in habit. Late.

Livingstone's Perfection.—Carries sparse foliage. Not a heavy cropper.

The most promising sorts (in addition to Earliana) were Harbinger, Landrith's Early, Buckeye State, and Stone.

Observations on the Queen Bee Competition.

W. A. GOODACRE, Senior Apicultural Instructor.

IN arranging for the Queen Bee Competition which was lately conducted at Wauchope, it was considered probable that, apart from the testing of the individuals for breeding qualifications, some enlightenment might be gained in other matters of interest to bee-farmers. It is considered fairly generally that queen bees which are subjected to the ordeal of postal transit in a mailing cage have their vitality affected, and consequently are not as good for future work.

Then, again, there is the question of the effect on the queen's work of the change in climatic conditions. The queens may be raised in a dry district and forwarded to a moist one, or they may be sent from a cold part of the State to a warm one, or the flora in one part of the State may be quite different to that of another. It is difficult, of course, to arrive at any sure conclusion as to what a certain queen bee would do if she had not been through the mail, or if she had been transmitted to and worked in a climate similar or different, as the case may be, to that in which she was reared.

In our Queen Bee Competition eighteen queens were received from various parts of the State in groups of three from each owner. A number of the queens had only one day in the mail, others had from three to four days. They came from the north, north-west, North Coast, and the south. The flora and climatic conditions on the North Coast, whence came a number of the queens, are similar to Wauchope, whereas in other parts from which queens came the flora and climatic conditions are quite different. There were from ten to twelve attendant bees in some of the cages to as many as twenty in others. As the queens were all posted about the same time, the weather conditions while they were in the mail were somewhat similar.

Queen Bees Nos. 16, 17, and 18, the winning group in the competition, had three days in the mail, and they came from the northern line, where climatic conditions and flora are quite different from Wauchope, on the Central North Coast. About ten attendant bees were in each mailing cage. The work of this group, especially in the cases of Nos. 16 and 18, indicated that the queens' vitality was not affected by the mailing, nor were the queens or their progeny noticeably affected by the change of climate. This opinion was formed not only from observation of the work of the queens, but also from comparison made alongside other young progressive stocks reared in the district.

None of the leading and progressive colonies in the competition showed signs, in my opinion, of loss of vitality during mailing or on account of any of the other conditions mentioned.

Turning to the consideration of Queens Nos. 7, 8, and 9, which had also three days in the mail, we find that that group scored the lowest award of points and provided no surplus honey. These queens were subjected to trying times in the mailing, owing to their having too many attendant bees. The number of dead attendants found on receipt of the queens proved that they had passed through an ordeal. I am of the opinion that, although the breeding required improvement in this strain, the poor mailing conditions had had some effect also on the queens' vitality.

Several other queens did poor work in the competition, and although there was no evidence of trying times in the mailing cage, it is quite likely that some condition previous to their being mailed had had some effect. For instance, was the nucleus from which the queen was taken a large one, and was the queen heavy with eggs when posted? Or was the queen taken from a full colony and posted straight away? Again, were the queens subjected to any hardships in the handling in preparation for mailing or in handling during the mailing period in the cages?

Summary.

It appears from our observations and comparisons that, with care in preparing the bees for despatch, in the handling of them in the mails, and in introduction work subsequently, queen bees can be forwarded long journeys by mail without noticeable effect on their vitality. It seems also that where trying times are experienced just previous to or during mailing a queen's vitality is likely to be affected to some extent.

Vineyard Notes for October.

Once again we enter the spring season with hopes for favourable weather conditions as regards freedom from disease. To be forewarned, however, is to be forearmed, and with a disease such as downy mildew one cannot afford to take any risk. Growers are again advised not to neglect the operations of spraying with Bordeaux mixture, and to begin spraying in October in order to be on the safe side. Various makes of spraying machines, both power and tractor, are on the market to-day; their prices have been continually reduced of late, so that they are now within the reach of men to whom their cost in the past was somewhat prohibitive.

Free copies of pamphlets dealing with the various vine diseases and their treatment can be had on application to the Department, and any further advice concerning them may always be obtained.

As a consequence of the recent beneficial rains, we may expect to find the vineyard more or less covered with weed growth, but the spring ploughing and subsequent cultivation (provided weather conditions are favourable for such work) should dispose of this. The season appears to be early, and in the earlier districts the vines have started to make their leaf. It is to be hoped that there may be no trouble from frosts. In low-lying localities where in the past severe frosts have been experienced, it would be wise to make provision for smoke fires.—H. L. Manuel, Viticultural Expert.

Lemon Curing Test at Gosford.

W. B. STOKES, Orchard Inspector, Gosford.

A SERIES of experiments, having in view the discovery of the best method of curing lemons, was inaugurated by the Gosford District Citrus Packing House in 1923. At the request of the growers the experiments were conducted under the supervision of the local officer of the Department of Agriculture.

Owing to unavoidable delays the gathering of the fruit was not commenced until 23rd July, 1923, and the test was concluded on 22nd October, 1923, a period of just three months.

Some of the lots under test would have kept in a marketable condition over a much longer period, but for various reasons it was thought advisable for this season to end the test on that date. Each lot in the test consisted of 450 lemons with the exception of Lot 5-5, which consisted of 150 lemons. The storing of the fruit was carried out at the packing-house under rather adverse conditions, no special care being taken to cover the cased fruit with canvas sheets or other material, such as is usual in some parts of the world. The conditions, however, were the best available at the time, and it is confidently hoped that they will be much improved during subsequent seasons. Owing to the late date at which the test began the lemons were gathered from half to fully ripe, some undersized and otherwise unsuitable ones being included in the test; consequently the results from this season's work were not as satisfactory as even the tabulated figures herewith show. A great deal of withering occurred in many of the lots, and the undersized fruit became withered and brown much earlier than the large lemons. Many instances occurred where the large fruits kept their colour and fresh looking appearance long after the small fruits in the same lot had become brown, withered, and unmarketable.

It is quite clear from the figures in the accompanying table that all rough handling must be eliminated if the crop is to reach the maximum of profit. Rough methods of handling were only included because assertions have often been made that careful handling has no effect in the after-keeping of the lemon. The experiments once more emphasised the fact that the slightest damage to the rind of the fruit while it is in the tender, fresh state is likely to set up decay. As the figures show, the lot receiving the most of this rough handling (Lot 1), exhibited decay almost from the beginning of the test.

"Drying off," or "sweating" as it is usually termed, before removing the fruit from the orchard appears from these figures to have reduced the amount of decay. Compare Lot 1 with Lot 2, and Lot 3 with Lot 4.

Two Outstanding Lots.

Two outstanding lots in the test deserve special mention, the results clearly indicating that some method of controlling the circulation of air, as covering the stacks of cases of fruit with canvas sheets or other material, to arrest evaporation and reduce high temperatures is distinctly beneficial. Probably the exclusion of light had also a beneficial effect. Lots 6 and 5-4 are referred to.

In Lot 6 the fruit was carefully clipped and handled, placed on straw on the ground in the shade of trees in the bush convenient to the orchard, and and the heap of lemons was covered with straw. This method was suggested because several growers at Matcham had been partially successful in keeping their lemons under these conditions. In our test the loss was not more than eight fruit, or 1·7 per cent. The fruit kept in an excellent condition right to the end of the test, with this exception, that the fruit on the top of the heap became brown, possible partly from exposure to light, and they withered slightly from exposure to the atmosphere. Should this method prove successful in subsequent seasons it should appeal to the average grower on account of its simplicity, and the absence of expense.

In Lot 5-4 the fruit was placed in paper-lined cases immediately after being carefully clipped, and after being stored in this condition for fourteen days the paper was removed from one case. It was intended to have removed the paper from the whole of the fruit later, but there was such a marked difference for the better in the paper cases that it was decided to hold them under that condition to the end. The fruit in the case from which the paper was removed soon became withered and dark coloured, while those in the paper-lined cases retained their fresh appearance throughout. The loss from decay was eight fruits or 1·7 per cent. It is interesting to note that seven of the eight decayed fruits occurred in the unpapered case, giving a percentage loss of 4·6, while the papered cases gave a loss of ·3 per cent.

In both of these lots the sepals and stalks remained green throughout.

The Value of Care in Handling.

There was not much difference in the loss from decay between any of the lots carefully handled, with the exception of Lot 5, but there was a great difference in the appearance of the fruit. In all lots that were not protected from the free circulation of the air, the fruit soon began to lose colour and freshness, the rind withered, and, in some cases, became hard.

All the lots carefully handled showed a combined loss of 2·2 per cent.; excluding Lot 5 the loss was 1·2 per cent. Lot 5 showed a percentage loss of 4·6. The loss in the combined lots handled in the usual manner for local markets (that is, roughly) amounted to 13·4 per cent.

Paraffin Wax as a Preservative.

In the test with paraffin wax the percentage loss was 57·3. This large number of decayed fruits does not show a true reflection of paraffin as a preservative. It was intended to have dissolved the paraffin in petrol and

put the lemons through the solution, the idea being that the petrol would evaporate leaving a thin coating of paraffin over the lemon. As difficulty was experienced in dissolving the wax by this method it was decided to melt the wax by heat and dip the lemons in it. Apparently this partly cooked some of the fruit, for almost from the beginning of the test the fruit in this lot began to exude moisture and a dark, gummy substance, and gave off the peculiar odour characteristic of cooked citrus fruits. The fruit remaining in this lot at the end of the test was in good condition, firm and quite fresh looking, with the stalks green. An endeavour will be made to find a means of dissolving the wax in the petrol next season, and to proceed as originally intended.

Summary and Conclusions.

1. The loss from decay from the whole of the fruit treated was 8·7 per cent.
2. The loss where the fruit was roughly handled, namely, pulled and treated as for immediate sale on local markets, was 13·4 per cent.
3. The loss where fruit was carefully clipped and handled was 2·2 per cent.
4. The loss from paraffin wax treatment was 57·3 per cent.

From the foregoing it will be gathered:—

1. That all rough handling of fruit must be eliminated.
2. The fruit should go through a toughening ("drying off" or "sweating") process before being carted away from the orchard over any rough roads.
3. That the cased fruit stored in a shed should be so stored that they can be covered at will with canvas sheets or some similar material to arrest evaporation and exclude light. The shed should preferably be insulated and closed during hot days, and provided with large intake and outlet ventilator which can be operated during the cool of night.
4. That any lot stored as was Lot 6—that is, out on the open ground—should be covered with ample thickenss of straw, ferns, or hessian, so as to exclude the light and protect the fruit from heat and drying winds.

It is thought that the exclusion of light is an important factor in the keeping of lemons, and that exposure to light injures the colour of the rind. A moist atmosphere seems necessary for the proper keeping of the fruit, as instance Lots 6 and 5-4, the former receiving all the winter rains upon them, and the latter always being surrounded with paper which was at all times pliable and soft with moisture.

The conditions under which the lemons were grown, gathered, and stored during the test were briefly as follows:—

1. The season had been particularly droughty for twelve months prior to the test beginning.

2. The fruit was gathered late in the season only, and was "tree ripe."

3. Just previous to gathering the fruit the weather had been fine and dry with cold, westerly winds.

4. The fruit was stored in a shed that was open during the whole of the day and exposed to the winds from the west.

It is proposed to store the fruit in a much cooler position during the coming season and protect them from the effects of dry, westerly winds. Under altered conditions it is expected that some of these deductions may be altered.

RESULTS of Lemon Storing Test at Gosford, 1923.

Lot No.	Method of Handling and Storing of Fruit.	Date Gathered.	Period of Drying Off.	Loss and Date of Inspection of Fruit. 7-8-23.	13-8-23.	27-8-23.	11-9-23.	24-9-23.	8-10-23.	22-10 23.	Total Loss.
		1923.	Days.								
1*	Pulled into picking shirts, tipped into boxes, no special care being taken to avoid bruises, and immediately carted to packing-house.	July 23	None	2	5	9	39	16	29	...	100
2	Pulled and handled as in Lot 1, dried off fourteen days, then carted to packing-house.	,, 23	14	...	0	0	1	5	3	27	36
3	Pulled carefully to avoid bruising, and immediately carted to packing house.	,, 23	None.	0	0	3	14	13	11	33	74
4	Pulled carefully as in Lot 3, dried off seven days, and then carted to packing house.	,, 24	7	0	0	1	4	5	11	16	37
4A*	Pulled carefully as in Lot 3, dried off fourteen days, and then carted to packing house.	,, 24	14	...	1	6	14	8	26	...	55
5	Clipped carefully, dried off fourteen days, and carted to packing-house.	,, 24	14	...	0	0	0	3	2	16	21
6	Clipped carefully, then spread on straw on the ground in shade of trees, and covered with straw.	,, 24	None.	...	...	...	...	...	...	...	8
5-1	Clipped carefully, dipped in copper sulphate solution (1 lb. to 500 gal.), dried off fourteen days, then carted to packing-house.	,, 23	14	...	0	0	0	2	1	4	7
5-2†	Clipped carefully, not dipped, then treated as Lot 5-1.	July 24-25	14	...	0	0	0	0	1	8	9
5-3	Clipped carefully, not dipped, then treated as Lot 5-1, and wrapped.	,, 31	14	...	0	0	0	0	4	3	7
5-4	Clipped carefully, not dipped, placed at once in paper-lined cases, carted to packing-house in fourteen days.	,, 31	......	...	0	0	0	1	2	5	8
5-5	Clipped carefully, dipped in paraffin wax, carted to packing-house after fourteen days.	,, 24	......	...	0	34	25	11	7	9	86

* This Lot on 22nd October, 1923, was in an advanced stage of decay, and no account of loss was made on that date.

† One case of this Lot was clipped while wet with rain and put away in a wet case.

A DAIRY cow may be defined as one of distinct dairy type and dairy breed, capable of producing a large amount of milk and butter-fat economically and at a profit, and producing regularly an offspring as good as herself or better.—J. D. DE WET, in the South African *Farmers' Advocate.*

A Profitable Citrus Orchard.

The Steps by which it was Established.

W. H. BROWN, Editor of Publications.

SUCCESS in the establishment of an orchard may be said to depend upon attention to a number of details, neglect of any of which may seriously prejudice the whole venture. Quite apart from the choice of the site in relation to soil, aspect, and locality, there are such factors as the preparation of the land, the selection of the trees, and the care of the plantation in the younger stages, each of which involves many points that may greatly affect the ultimate result. In these respects every orchard no doubt has its lessons to teach, but nothing is of such positive value to growers generally as the steps by which a really profitable block has reached the stage of full growth. Many orchards exist in this State of which the history would be helpful to other growers, but for the moment attention may usefully be directed to a fine, even grove of citrus trees planted in August, 1914, on the Penang Mountain, 6 miles from Gosford.

The Preliminaries.

The owner of the property had had the project in view for years, and every step that led up to the stage at which the trees were planted out was taken with careful attention to detail—such care, in fact, as to make the orchard to-day an object of pride to the original planter and of profit to the present owner. Mr. A. T. Hunter, then Fruit Inspector of the Department of Agriculture, stationed at Wahroonga, but now located at Castle Hill, had selected a 40-acre block on "the mountain," with a grey-coloured free-working, sandy loam, well timbered, with permanent water, and northerly aspect.

An area of 10 acres was cleared as a beginning, and in anticipation of planting was thoroughly well ploughed to a depth of 9 inches in May, 1914. The ground lay in the rough all the winter, and staking-out—calculated at distances of 18 feet 6 inches by 22 feet to suit the land—was carried out in July, the holes being broken up with a pronged hoe to get a fine tilth that would give the roots of the young trees ample free soil for development.

To afford plenty of room for turning, a headland of 33 feet was left all round, and against the fences breakwinds were planted, consisting of *Callitris cupressiformis* on the southern boundary, and of *Pinus insignis* on the western side. On the eastern side the neighbour had already planted *Pinus insignis* close to the fence. Inside the breakwinds on the southern and western sides, and close to the fence line on the east, a drain 3 feet 6 inches deep was opened up to take the drainage and keep back the roots of the trees in the breakwind and the bush. These drains were necessary to carry the drainage into the permanent stream on the northern side, as the

country is of a type that is apt to hold water. Certain damp patches threatened to be troublesome, and there underground drains were put in connecting with the open drains round the outside. To-day these drains are still well preserved, and the present owner of the property, Mr. S. Spencer, in undertaking an extension of the orchard is adopting the precaution of extending the drainage system also.

Choosing the Material.

As already suggested, the establishment of this orchard was a matter of deliberate preparation. Mr. Hunter was planting for himself, and it was an essential part of his programme that only the best of material should be used. The seeds from which the stocks were raised were personally selected two years before from a good, vigorous, common lemon tree at Narrabeen, and were sown in a suitable spot on the North Shore line. From the seedlings so obtained only the best were transplanted into nursery beds in sandy soil, which for nursery stock is a particularly desirable soil medium as producing a large and healthy root development. There they were budded in March, 1913.

And by the budding hangs half our story. The orchard is to-day a testimony to the value of using wood with a known history. The 520 Valencias form as fine a bed as could be seen—well grown, well shaped, even, and carrying regular crops of uniform quality. The Washington Navels (ninety-nine in number) tell the same tale, both to the eye and to the banker. So do half the mandarins planted. The other half of the mandarins—bought as worked and recommended as something special—grew to maturity and then had to be grubbed out as worthless. In other words, the trees worked by this intending orchardist himself proved all that could be desired—the only block that turned out otherwise was made up of trees that were bought. Unfortunately, the experience is not an isolated one, for many a man who has begun the serious business of planting an orchard, expecting it to be a lifelong pleasure and profit, has suffered disappointment and loss. It serves to emphasise once more the extreme importance of a knowledge of the material from which an orchard is to be built up.

What "Bud Selection" Involves.

Truth to tell, ideas about the method by which such material is to be selected have been undergoing considerable alteration during the last few years. Many fine beds of citrus trees can be pointed to in this State which have been obtained by taking budding wood from trees known to be of good bearing habit, but the impression has latterly been gaining ground that it is insufficient to choose a good tree for the purpose. Growers have long observed a wide discrepancy between individual fruits borne on the same tree. An accompanying illustration presents two very different fruits picked from the same navel tree. One was of a most desirable type—fine in skin, light in colour, perfect in form—the other was just the opposite—coarse, red, large, flat-shaped, and with a prominent navel. The work of A. D. Shamel in California has brought to light as many as ten totally

different types of fruit on the same tree, and to-day growers in our citrus districts have come to recognise the significance in relation to the planting of new orchards of the fact that no class of fruit shows so great variation on one tree as does citrus.

Under the influence of growers' own observations, and of the work of Shamel and others, it is being realised that there is a probability that buds taken from wood that has borne undesirable types will produce similar fruits, while the chances of getting really good marketable specimens are improved if only wood is used which has borne fruit of that class. That variations will occur even under the best of conditions as to selection is admitted, but at least probabilities are decidedly improved if preference is given to the best bearing wood. It is reported of Mr. Benn, a successful grower in the Castle Hill district (now deceased), that he himself selected most carefully the material for a new block. The selection was attended with marked success, except for two trees, as to which he admitted that he "could not have been looking just then." Obviously, even men of experience are apt to make mistakes at this point.

"It's easy to take wood that is not producing good fruit if you have not the fruit to guide you," said Mr. Hunter, standing a few weeks ago in front of a promising-looking navel tree in Mrs. Benn's orchard. "Here's a twig with nice plump buds, and round full wood, but the fruit is of poor quality. If budding wood is taken in the spring after the fruit is off, that would look like a desirable twig. The best time to bud is in early autumn. Then the wood can be selected while the fruit is on the tree, and though no doubt a bit green, the type is becoming apparent. No one would then choose such a twig as this." Walking round the same tree, he picked upon an equally good piece of wood with the additional recommendation of a fine specimen of fruit still hanging. "It means sacrificing the fruit to cut this wood in the autumn, of course, but you then get budding wood that you can have confidence is likely to give a profitable tree."

"It may cost a few cases of fruit to get an orchard," said Mr. W. B. Stokes, Orchard Inspector at Gosford, when the same question was under discussion, "but you have the satisfaction of knowing you have done your best to keep up the type."

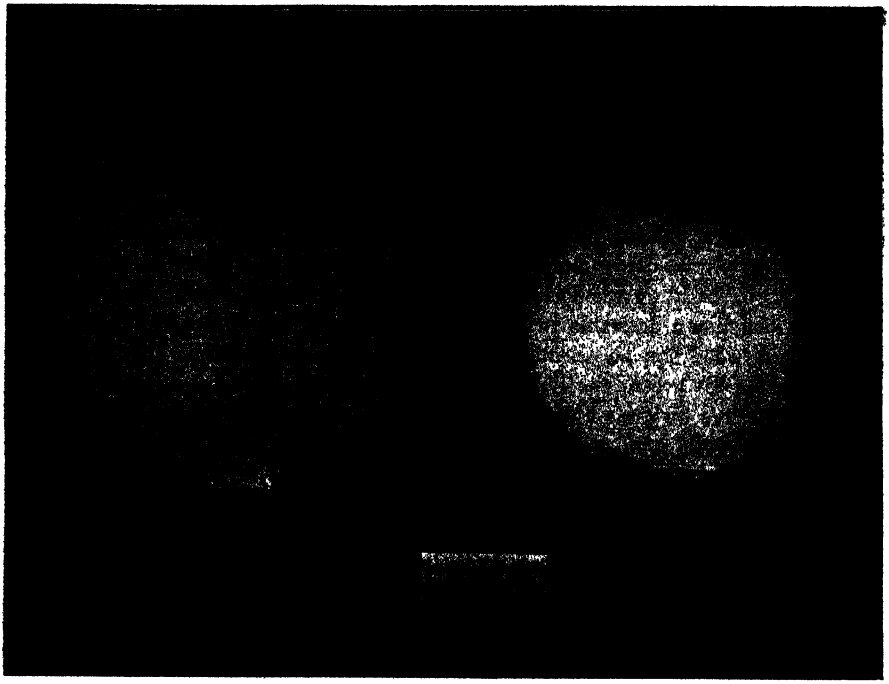
The Testimony of Growers.

Nor is the idea limited to officers of the Department. In citrus districts one finds the best of growers beginning to assent to the proposition that budding wood should be taken from behind the fruit. Mr. S. J. Black at Lisarow—in the midst of ideal citrus country and surrounded by some of the finest groves in the State—affirmed that though he did not himself select as they do in California, he fully believes it well worth while for anyone who contemplates planting an orchard to go round in the autumn to good bearing trees and mark the branches carrying well-shaped, good quality fruit with a view to using that wood. "You can go to almost any tree and get several types," this grower added, "but you only want to reproduce the best."

"Across the road," said a Castle Hill grower, "is a block of trees that proved no good. Here are better trees yielding bigger crops of more uniform fruit. The first lot we bought. The second we worked ourselves." Instances of this kind of thing could be multiplied almost indefinitely.

What to Take and what to Avoid.

In selecting budding wood, therefore, experience suggests that a tree of good bearing habit and carrying a good type of fruit should be chosen, and from it a twig carrying a true type of naval orange, of good size and shape, fine skin (though it is usually considered that the skin is largely



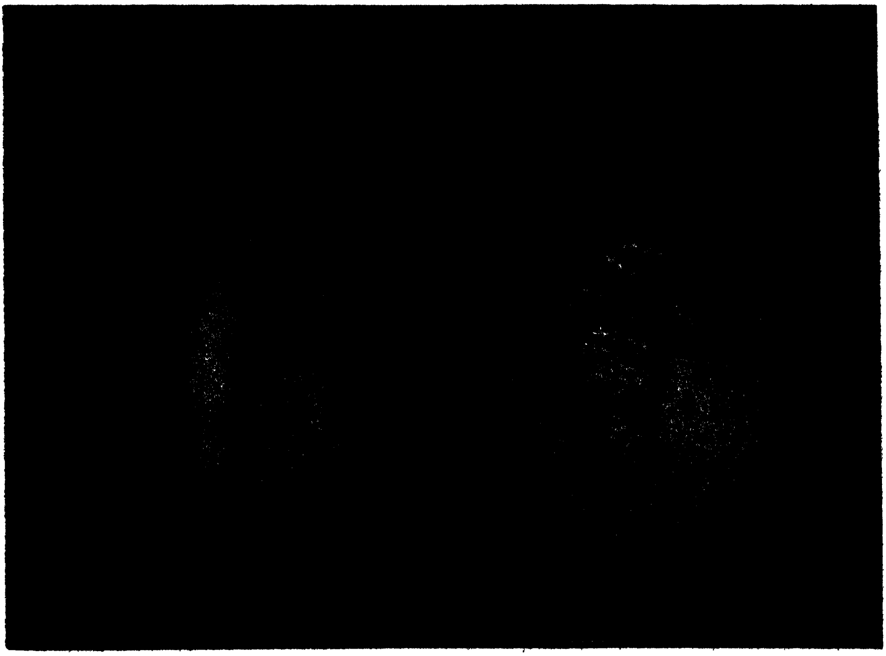
Two Oranges Picked from the same Tree.

They illustrate the variations that may occur. The one on the left was large, coarse, red, and spoiled by a prominent navel. The other was fine, light coloured and perfectly shaped—the very type of which one would like to have a whole bed.

affected by the manuring), and with navel not too prominent. Round, healthy wood, with well-developed, plump buds, is desirable, and it is well not to cut part of the twig away, but to go right back as though pruning. In all circumstances avoid flat wood.

How much wood it is necessary to take to get a given number of buds depends in part upon the season. Following a year of good rainfall long wood with plenty of buds can be obtained with ease, while after a dry season a good deal of wood may have to be cut to get a few buds.

It is usually considered that the best and most vigorous buds are on the second-last growth of wood behind such fruit, though at times goods buds can be obtained on the third growth back, and often also on the last growth. In the illustration on page 745 is shown a very good piece of budding wood with the fruit still attached; it was cut in the orchard of Mrs. Benn, Castle Hill, and carries seven buds, one of them on the last season's growth, three on the preceding season's growth, and three on the previous growth again, behind which can be seen matured wood, to which the branch had been pruned three years ago. The fruit might perhaps be a better type, but in this case the twig was cut to illustrate the wood rather than the fruit.



Abnormal Types of Fruit.

No one would wish to perpetuate these. Both were taken from trees carrying many good sorts, but they illustrate the necessity for selecting budding wood with the fruit on the tree.

Long, sappy water shoots, such as spring from the centre of the tree, no doubt look attractive, for they bear promise of quite a number of buds easily obtained, but they are really very undesirable, for the reason that nothing is known as to the fruit-bearing capacity of the wood, and as a matter of fact it is usually low on wood of this class. Some propagating is even done from nursery beds, and, worse still, the practice is continued from year to year, until all idea of the class and quantity of fruit obtained from the worked trees has been lost.

How much better off than this is an intending grower who has carefully selected for himself the material from which to build up his orchard. One

even hears at times of men buying up a nurseryman's season's remainders, reckoning them cheap! Is it any wonder that so many acres of planting are abandoned every year as unprofitable? Is it any wonder, too, that the Department's experts should urge again and again that only the best is good enough? The absolute importance of the history of the budding wood being known is now being accepted by many experienced citrus growers to such an extent that they are practising it in any extension of their holdings. The Department suggests the same methods for all who contemplate a venture in growing citrus fruit.

If it be urged that budding is something the grower knows nothing about, the method of selecting good budding wood and handing it to a reliable nurseryman to work it on to the stocks suggests itself. It has resulted quite satisfactorily in certain cases.

Reference has been made to the autumn as the best time for working navel oranges.. It is opportune to mention, perhaps, that this does not apply with the same force to oranges that hang well into the spring, as do Valencias and Joppas. In these cases it is possible to select budding wood with the fruit still on the trees in the spring, and therefore nursery stock may be worked quite satisfactorily at that time. On occasions, even an experienced grower may fail to get through his budding work with navels in the autumn, and then, conditional on the buds being taken from trees of known good habit, it may be permissible to work the stock in the spring in order to save a season. The counsel of perfection, however, remains, and good counsel too—especially for beginners.

It is well to cut the bud thin. Some nursery workers take the little bit of wood out of the bud, but it is not essential if the bud has been cut thin, and the inexperienced man will save himself many mutilated buds by leaving it alone. In the case of mandarins, Mr. Hunter has a preference for removing the bit of wood.

Selective Methods at every Stage.

Returning from this somewhat lengthy diversion on budding to the planting of Mr. Hunter's orchard at Penang Mountain, it may be recorded that in his case the budding wood for the Valencias was taken from certain imported trees in the St. Ives district, and that for the navels from trees of historical interest at Dural, which have also furnished the material for many another good block of navels in this State. The wood for the Emperor mandarins, which were budded by Mr. Hunter himself, was selected from a good block at Woodlands.

In the nursery the little trees were given every opportunity to do well, and in arranging for their transfer to Gosford care was taken that they should feel the shock as little as possible. The best trees were lifted from the nursery beds and packed in cases with damp sawdust, just as is done with trees for export. In that condition they could have remained out of the soil for a week or two without harm. It was a bit expensive, perhaps, but they reached their new home without any drying out of the fine fibrous roots. Under exposure to the atmosphere, even for a short

time, the finer roots are bound to dry out and to suffer almost irreparable damage; at any rate trees treated carelessly in this respect at planting time must suffer a serious check, from which they do not recover until

A Desirable Piece of Budding Wood.

Three season's wood can be seen on this twig, as indicated by the arrows. It was bent into shape for the photograph.

fresh feeding roots have been formed. With protection also from the drying influences of sun and wind in the field, they were planted in the holes in which the soil had already been deeply worked into a fine tilth.

It is interesting to reflect how selection was practised at every stage in the planting of this little property. The outstanding feature, no doubt, was the care taken to ensure good budding material, but let the steps be noted:—

(1) The seeds were obtained from a tree of known vigorous type.
(2) The best grown seedlings only were transplanted into the nursery bed.
(3) The budding wood was self-selected from trees with good records, and with the fruit still hanging.
(4) Only the best of the worked plants were finally planted out.

Each of these operations, no doubt, had its own influence upon the fine beds of trees that have been obtained. The first, second, and fourth selections were probably chiefly valuable in relation to the uniformity and the generally high standard of vigour that is a feature of the trees, while the quality of the fruit and in a large measure the weight of the crop may be connected with the third selection.

Planting—effected to the accompaniment of the first "alarms and excursions" in Europe—was purposely made on the shallow side. Resoiling is such an essential feature of citrus production to-day that it is necessary to avoid deep planting, or the roots become too deeply covered in subsequent years.

Subsequent Cultivation and Manuring.

The after-cultivation of the place was consistent with the preliminaries. Weeds were not allowed to grow, and for the first few years intercropping with passions was profitably practised.

The trees were given a good start with dressings of blood and bone, and it may be well to state briefly the treatment in this respect from year to year, as the present vigour and profit of the trees has doubtless been greatly contributed to by the manures used.

In recording, in the following paragraphs, the dressings actually given from time to time, it is not intended to convey that the actual date of application is in any way essential.

20th August, 1914, 4 oz. blood and bone per tree.

26th October to 5th November, 1914, 8 oz. blood and bone per tree.

18th to 23rd January, 1915, 6 oz. each Shirley's No. 5 and Kitchen's blood and bone per tree.

5th to 11th July, 1915, 2 lb. blood and bone per tree.

25th to 29th July, 1915, ½ lb. sulphate of iron per tree, dug in.

20th to 31st December, 1915, 4 lb. blood and bone per tree.

1st to 24th January, 1916, ½ lb. sulphate of iron per tree, dug in.

9th to 18th July, 1916, 1 lb. sulphate of iron per tree, worked in with Dutch hoe.

23rd July to 14th August, 1916, 2½ lb. Wellington phosphate, ½ lb. sulphate of ammonia and ½ lb. kainit per tree.

17th to 22nd January, 1917, 5 lb. Wellington phosphate and 1 lb. nitrate of soda per tree.

16th to 28th August, 1917, 4 lb. Shirley's No. 8 per tree.

6th January to 21st February, 1918, 2 lb. bonedust and 2 lb. Shirley's No. 8 per tree.

15th July to 12th August, 1918, 4 lb. Gibbs Bright's special orchard manure per tree.

11th February, 1919, 5 lb. Gibbs Bright's special orchard manure to each navel tree.

12th to 14th February, 1919, 6 lb. O'Riordan's bonedust to each Valencia orange and Emperor mandarin.

The manures were intentionally changed from year to year to ensure that the artificial supply of plant-food should be as complete as possible. The sulphate of iron was introduced as a preventive of exanthema, and with very satisfactory results. In the first couple of years a few trees showed signs of red scale, and these were marked and fumigated. Later some brown olive scale and white wax scale appeared, and red oil was applied for the olive scale and soda wash for the white wax—but not mixed.

In the autumn of 1919 Mr. Hunter decided to sell the property. The labour and the ambitions of years had gone into it, and the prospects of the investment proving a good one were by that time all that could be desired, but other considerations were making themselves felt.

The Present Owner's Testimony.

The purchaser turned up in Mr. Spencer, already mentioned, and his work has been a continuation of the methods by which the place had been brought to such a promising stage. The trees have been thoroughly cared for, diseases and pests have been regularly controlled, and resoiling and the application of fertilisers and manures have been regularly carried out. "There is only one way of getting good clean fruit," this grower said in the early part of August, "the secateurs and the spray. You must keep the tree open to get inside to spray and to bring the fruit to the outside."

Then he turned to the place where the mandarins had been that had to be grubbed out. "I did my best with them for years, but it was no go. The trees were big and ornamental looking, and they used to blossom profusely and set a big crop of fruit, and then while still small it would all come off within a week. The rest of the trees on the place were budded by Mr. Hunter himself, and have done well, but these did no good at all."

Standing among his trees, Mr. Spencer remarked that if neglected for a year or two the place would go to pieces very quickly. "This orchard has got used to good living. Manures and fertilisers, and also the cultivators, have been kept well up to it. It receives annual dressings of fertilisers (changed from time to time) at the rate of ½ ton per acre, as well as being resoiled at times. These Valencias are consistent croppers. They have yielded practically a four-figure crop every year for the last three or four years. And the Washingtons—there are ninety-nine of them—for the last five years the net return has been not less than £100 per year, and this year it is more."

Conclusion.

Let it not be thought that the property at Penang Mountain to which we have thus directed attention is altogether alone in the State. It has been selected for description in the foregoing pages because its history is accessible, and because it furnishes its own evidence of the results which sound methods at every stage have procured. Large beds of trees of marked vigour, carrying heavy crops annually of high-quality fruit are to be seen

in various districts, and many silent—yet eloquent—testimonies to the results that attend methods such as we have been describing. There comes before us a block of navels on the property of Mr. V. S. Fagan, at Lisarow, that manifests magnificent development, and at 3 years old carries over a case of fruit per tree. It, also, is not altogether alone.

Everywhere, too, one gathers in conversation with growers that they entertain no concern about the future of fruit-growing. These men have learned that the market is capable of absorbing large quantities of attractive fruit, and that it is possible for the grower to adopt measures that offer a reasonable assurance of regular and payable crops of the right type. With the prospects of the development of an export market—especially through co-operative channels—their confidence rather increases. It is to the methods of such men that we point the less successful and the beginner.

A Potato Trial at Albury.

Experiments with potatoes were again conducted during the past season in conjunction with Messrs. A. Pannach and Son, at Lavington, near Albury. The soil was a fertile sandy loam.

The extremely wet weather delayed ploughing until September. The land was then harrowed and scarified, and planting took place on 28th December. The rows were 3 feet apart, and the sets 18 inches apart.

The season was particularly favourable to potatoes, and excellent growth was made by all varieties. Unfortunately, the Rutherglen bug made its appearance during January, and seriously checked the early growth of all the white-skinned varieties. Those with coloured skins (Symington, Batlow Redsnooth, Elliott's Pink Eye, Red Ruby, and Batlow Cross) were not attacked.

The effective rainfall was as follows:—January, 202 points; February, 297; March, 288; April, 221. Frosts occurred in May, and the crop was dug at the end of the month.

Yields per acre.

	t.	c.	q.		t.	c.	q.
Symington (no manure)	13	6	1	Factor (no manure)	8	15	0
Batlow Redsnooth (no manure)	12	12	2	Up-to-Date (no manure)	8	13	2
Elliott's Pink Eye (no manure)	12	6	1	Langworthy (no manure)	8	10	0
Red Ruby (no manure)	12	1	1	Scottish Triumph (no manure)	7	7	1
Batlow Cross (no manure)	9	14	1	Factor (2 cwt. superphosphate per acre)	9	4	3

Experiments in this locality over a number of years have shown that while in a moist season the application of fertilisers is profitable, in normal seasons their application is not advisable, as the rainfall is usually meagre.

The red-skinned varieties have given the heaviest yields this season, but this is largely due to the fact that they were not attacked by the Rutherglen bug. Symington withstood more frost than any other variety under trial; it is a heavy yielder, but the tubers are of somewhat inferior quality. Batlow Redsnooth is a good yielder, excellent shape and quality, light-red in colour, and with very shallow eyes; it is a most attractive variety. Elliott's Pink Eye was tried at this centre for the first time; it is a good, firm potato of good shape and quality.—E. S. Clayton, Agricultural Instructor.

Poultry Notes.

October.

JAMES HADLINGTON, Poultry Expert.

The hatching season is now over. It can be taken as a matter of definite experience that the end of September is quite late enough to have chickens hatched under specialised poultry farming conditions. There are, of course, exceptions to be made where only small numbers are hatched and under special conditions, but taken by and large hatching is better suspended from the time mentioned. For all practical purposes, then, the hatching season is over, and the principal work on the farm will be in connection with rearing. Thinning out the young stock as they grow, and separating as far as practicable the different ages and sexes, all have their bearing on future development, which is such an important factor on the farm. Failure to properly carry out this work at the right time means stunted growth, which in turn has a most inimical effect on the returns from the birds, both in egg production and from the cockerels as table poultry.

"Keep the growing stock moving" should be the axiom of the poultry-farmer. In properly systematised work the movements of growing stock should be as follows:—

(a) From the incubator to the brooders as soon as the chickens are dry; there to remain until 6 to 7 weeks old, subject to thinning out where necessary.

(b) From the brooders into the rearing pens provided for the age of 6 to 10 weeks.

(c) Removal to the colony houses and yards, or their equivalent position in the rearing system, there to remain until about to commence laying.

The cockerels, of course, will be dealt with in the meantime for sale or reserve as may be desirable or expedient.

Reserving Cockerels.

As pointed out some months ago, if twenty cockerels are required for breeding, at least sixty should be kept in the first place. These might then be culled over at three, five, and eight months, respectively. The true value of a cockerel's quality cannot be properly determined until about that age. Hence it is that the farmer who requires a given number of cockerels for breeders, and only reserves about that number, is sure to be breeding from many unsuitable specimens, and the general average of quality in the flock will be seriously impaired in the course of two or three generations. In this connection, as has been repeatedly pointed out in these notes, pedigrees stand for nothing unless the bird or birds are in themselves good representative specimens of the breed. Hence the necessity for sufficient

numbers for continued selection and culling. Another important factor in retaining birds for stud purposes is that it is the early hatched birds that should be retained, not the later ones.

It was observed last season that many farmers were tempted by the high prices being realised for very young birds early in the spring to sell their early stock, in consequence of which midseason and late-hatched cockerels were reserved for breeding stock. Not only are such birds to a greater or lesser extent immature when required, but other things being equal, the earlier stock has usually the advantage in stamina and physique over those of the later hatchings.

Incidence of Production and Prices.

The pinnacle of egg production has now been reached for this year, and the thought uppermost in the minds of producers is the price of eggs and the cost of feeding. There is some disappointment that eggs have fallen in price below 1s. 6d. per dozen, at which price it was thought they would hold during the period of high production. The position is, however, better than for the corresponding period of last year, for eggs are 1d. to 2d. higher in price, and the cost of feeding has eased somewhat in comparison with the same time last year. To this extent, at the time of writing, the outlook has improved.

The Export of Eggs.

It might be profitable at the present time, while eggs are being exported and cold stored, to visualize how much poultry-farmers themselves could do in the direction of increasing the value of their own production. It is generally admitted that the poultry industry has reached a stage when its expansion, and almost its very existence as an organised industry, depend to a very large extent upon export. When it is realised that one of the largest houses handling eggs has for some weeks past been packing not less than one-third, and up to half of their total incoming consignments for export, the importance of the latter to the industry is obvious.

But how many individual poultry-farmers fully realize the part they might play in the profitable export of eggs, and the influence they could exert in enhancing the value of their own production? We have now definite experience that a stage has been reached when the price of Australian eggs in Great Britain will very materially operate to regulate the prices ruling in Sydney during the cheap season, and this in turn to some extent all the year round. In this connection "quality" is the key to the position. It was shown in figures given in my lecture at the last Royal Agricultural Society's Show (and published in "Poultry Notes" in May), that our eggs were gradually making better prices each year since systematic export of eggs by pool floors has been in operation, until we were closely approaching the prices made by eggs from countries near to Great Britain. This, it was shown, was the outcome of the quality of our eggs becoming recognised. It was also stated that we could very materially improve on what was then being done in that regard.

The Farmers' Interest in Quality.

This is good so far as it goes, but my purpose here is to emphasise that a little more care and foresight on the part of a small section of poultry-farmers who are indifferent to these matters would result in a material improvement to the advantage of the whole industry. It falls to the lot of the writer to examine these eggs for export, and the weaknesses and strength of the whole position can therefore be accurately gauged. Packing is now almost perfection, grading has improved considerably, but with regard to the quality of some of the eggs there is room for improvement, *and that improvement must come from a small section of consignors.* The great bulk of the eggs sent to market leaves very little to be desired, but the small number referred to jeopardise the good name being made for Sydney eggs.

It is only by the strictest surveillance, for instance, that stale eggs are kept out of the packing for export, and these eggs are a constant menace to our good name. The position is this: it is not possible to ensure that all the men who are packing are expert in the detection of quality in eggs on appearance, especially as such employment only lasts for about three months of the year. It therefore follows that some inexpert hands have of necessity to be employed to do the work. Most of the brands of eggs coming forward from specialised poultry-farms are reliable as far as freshness is concerned. In these cases any packer with ordinary intelligence can detect weak, porous, cracked, or soiled eggs; or eggs below standard weight can be checked with very little supervision, but to detect stale eggs is quite a different matter, and requires some experience or a resort to "candling," *i.e.*, testing by light. Here again some expertness is necessary. But it is not alone a matter of experience and expertness—it is a question too of expense in packing. Every unnecessary move that has to be made by the packers, and every item of supervision that has to be exercised increases the expense of packing. In the final issue, this means, in as far as co-operative pool floors are concerned, a smaller net return for the eggs exported.

It follows, therefore, that careless packing and grading on the farm reduces the quality, pulls down the price of our eggs, and very largely increases the cost of packing for export. All such extra costs or lowering of quality react on the returns to the poultry-farmer, either directly or indirectly, and what applies to export also applies equally to eggs cold-stored. As was remarked in these notes last February, the quality of the eggs when put into cold storage determines what may reasonably be expected when they are brought out. To ensure freshness, therefore, eggs should be marketed twice per week, and any doubtful ones should be branded "case eggs."

Poultry-farmers have, therefore, more than a detached interest in regard to the quality of their consignments. The cost of packing and expenses in connection with export has been considerably reduced during the last two years. Our eggs, too, have made better prices in comparison with those coming from other countries than ever before, and between these two

factors there is at least a few pence per dozen to the good. It now remains for the poultry-farmer by good and conscientious work to still further increase quality and reduce expenses in the directions indicated.

Colour of Eggs.

The colour of the egg might appear a small matter to many, but now we have reached the stage where export is of such vital importance to the poultry industry the colour of our eggs is of some importance. In packing for export the white and brown coloured eggs are packed separately to meet the requirements of the London market. In this connection there is, of late, a considerable falling off in the colour of many of the eggs sent to market. What should be brown eggs (the product of Orpingtons, Langshans, &c.), range from deep brown to nearly white. Thus the classification becomes difficult, and in many cases the eggs packed for export as "browns" are in reality a very piebald lot—neither one colour nor the other. On the other hand, if pale looking eggs (nearly white) were packed as "whites" they only spoil the appearance of that class. It would be a good thing, now we have to compete in a market which is somewhat fastidious in respect of definition in colours of shell, if poultry-farmers could pay more attention to this factor.

This matter of colour, too, has an even deeper significance. It portends that everything is not all as it should be with respect to our breeds. Eggs from pure-breds should be either brown or white—the latter of European origin, and the former of Asiatic. Some allowance may be made for old hens of Asiatic bread, or for hens that have laid continuously over a long period, and whose eggs are likely to be less strong in pigmentation than those of young birds or birds who are only laying a normal number of eggs.

The falling off in colour observable in many lots is apparently not confined to these conditions. and the matter is worthy of more consideration than it is receiving.

Analysis of a Natural Lick.

A sample of red earth from the Coolah-Tambar Springs district reached the Department recently, with a remark as to its apparent palatability to rabbits and an inquiry as to its value (either alone or mixed with salt) as a lick for stock.

The substance was found to contain .17 per cent. of water-soluble solids; the water extract was slightly alkaline and contained small quantities of sodium chloride, sodium carbonate, lime, magnesia, and sulphates. The correspondent was informed that neither in its original state nor mixed with other substances had it any economic value. It was added that a number of natural licks had been examined by the Department from various parts of the State. In some cases these contained very small amounts of saline matters, but as a general rule it could be said that there was strong evidence in support of the suggestion that the secret of their appeal to stock was a certain unctuousness of feel and taste, especially when wet.—A. A. Ramsay, Chemist.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—

Boone County White	J. Chittick, Kangaroo Valley.
	Manager, Experiment Farm, Berry
Craig Mitchell	K. W. D. Humphries, Muswellbrook.
Fitzroy	Manager, Experiment Farm, Grafton.
	A M. Hooke, Taree.
	J. P. Mooney, Taree.
	F. W. Hill, Yarramalong.
Funk's Yellow Dent .. .	N. C. Pyemont, "Moondarra," Gundagai.
Golden Beauty	A. M. Hooke, Taree.
Golden Superb	W. H. McMahon, Pola Creek, *via* Kempsey.
Golden Glow	W. A. McLeod, Ben Lomond.
	J. A Reynolds, Ben Lomond.
Hickory King	J. Campbell, Wingham.
	W. Cole, "The Grange," Pambula.
Iowa Silvermine ...	H. Mallaby, Farm 1864, Griffith.
Large Red Hogan	G. E. Levick, Taree.
Leaming	Manager, Experiment Farm, Grafton.
	W. Ryan, Oxley Island.
Manning Silvermine	H. E. Smart, "Purfleet," Taree.
Pride of Hawkesbury	Dempsey Bros., Taree.
Sundown...	J. S. Whan, Llangothlin.
Wellingrove	Manager, Experiment Farm, Glen Innes.

Millet:—

Hungarian	Manager, Experiment Farm, Yanco.
Japanese	Manager, Experiment Farm, Coonamble.

Sweet Sorghum:—

Collier	Manager, Experiment Farm, Grafton.
Early Amber Cane	Manager, Experiment Farm, Bathurst.
Honey	Under-Secretary, Dept. of Agriculture, Sydney.
Orange	Manager, Experiment Farm, Yanco.
Red Amber	Manager, Experiment Farm, Glen Innes.
Selection, No. 34	Manager, Experiment Farm, Yanco.
Selection, No 61	Manager, Experiment Farm, Berry.

Grain Sorghum:—

White Yolo	P. A. R. Gersbach, Leeton
Feterita	Manager, Experiment Farm, Coonamble.
Kafir	Principal, H. A. College, Richmond.
Manchu Kaoliang	Manager, Experiment Farm, Bathurst.
Milo	J. T. Maunder, The Wilgas, Pallamallawa.

Dual-purpose Sorghum:—

Darso	Manager, Experiment Farm, Glen Innes

Grass :—	
Elephant	Principal, H. A. College, Richmond.
	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Yanco.
Kikuyu	Principal H. A. College, Richmond.
	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Yanco.
	Manager, Experiment Farm, Cowra.
Wimmera Rye	Manager, Experiment Farm, Temora.
Potatoes :—	
Batlow Redsmooth	E. M. Herring, "Sheen," Batlow.
Batlow Cross	E. M. Herring, "Sheen," Batlow.
Coronation	E. M Herring, "Sheen," Batlow.
Coronation	J. A. Reynolds, Ben Lomond.
Early Manistee	G. W. Kelly, Caves-road, Oberon.
Early Rose	G. W. Kelly, Caves-road, Oberon.
Factor	G. W. Kelly, Caves-road, Oberon.
	K. Bowen, "Newport," P.O. Orange.
Langworthy	G. W. Kelly, Caves-road, Oberon.
	K. Bowen, "Newport," P.O., Orange.
Late Manhattan	K. Bowen, "Newport," P.O., Orange.
Satisfaction	G. W. Kelly, Caves-road, Oberon.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The Storing and Ripening of Honey.

The general impression, previous to recent investigations in the storing and ripening of honey, was that the bees ripened the honey, preparatory to sealing it, by circulating air through the hive. It is now practically definitely established that, while the circulation of air in the hive assists to some small extent, the greater portion of the excessive moisture content of unripe honey is removed by the bees. An interesting article by Wallace Park in the July issue of the *American Bee Journal* concludes with the following summary:—

"The nectar-carrier, upon her return from the field, delivers her load to one or more house bees. The house bees then put the nectar through a process which provides for the rapid evaporation of surplus water and probably permits the addition of enzymes, such as invertose, which are involved in bringing about the chemical transformation of the sugars. When first placed in the comb it has already had a considerable part of its surplus water removed. Later, such honey probably is removed from its cell by other bees and its moisture content further reduced in a similar manner, until its consistency becomes practically that of ripe honey.—W. A. Goodacre, Senior Apicultural Instructor.

A Rival to Paspalum.

Kikuyu grass (*Pennisetum clandestinum*), by providing more feed during dry periods and winter months than paspalum (*Paspalum dilatatum*) is becoming increasingly popular in coastal districts. In the warmer parts of the State it is supplanting paspalum, and proving useful on stony hillsides and in assisting to control bracken fern.—J. N. Whittet, Agrostologist.

Control of Codlin Moth.

H. BROADFOOT, Senior Fruit Instructor.

THE apple and pear crop of 1923-24 was much below the general average in this State, and as a light crop is usually followed by a heavy one, the prospects for next season are very bright. In order that growers may not lose an unduly large part of their crop by influences within their control, they are advised to have everything in readiness to fight the codlin moth, which otherwise will take heavy toll. Effective combative measures, especially in closely-settled districts, will require the united efforts of all growers. Only by common effort can satisfactory results be secured.

Killing the Carry-over Grubs.

It is important to deprive the grubs, as far as practicable, of anything that forms a protective shelter; hence all loose bark should be carefully scraped from the tree. This should, of course, be done thoroughly and systematically early in the season, before the grubs have reached the moth stage. The operator, while removing the bark, should keep a keen look-out for and destroy all grubs. When it is considered that the female moth lays about eighty eggs it will be seen how important grub destruction is. The earlier this is attended to the better, as the carry-over grubs being destroyed, danger of wide infestation is minimised.

The use of bandages is strongly recommended, as experience has shown that by this means large numbers of grubs may be caught and destroyed. It may be admitted at once that to do this thoroughly entails a large amount of labour, but it pays, for bandaging, in conjunction with spraying, will greatly assist to reduce the pest. The removal of loose bark, as recommended above, increases the effectiveness of bandaging, for the grub, deprived of the loose-bark shelter, seeks the shelter of the bandage, and is then easily located and killed.

Ensure Thorough Agitation of Spray Material.

Growers should thoroughly overhaul the spraying outfit, and see that it is in satisfactory working condition, and that the hose is not leaky. A sufficient length of hose should be used to allow the nozzlemen to work freely around the trees, even when the horse does not instantly respond to the driver's "whoa," and stops a little further from the tree than was desired.

A good agitator is absolutely necessary for effective work, as the spray must be well agitated before spraying commences, and must be kept agitated during the actual spraying operations. It is not unusual to see the engine started and spraying commenced before the arsenate of lead has been sufficiently mixed in the vat. The arsenate of lead does not form a solution; it forms a mixture, and, being heavy, it tends to sink to the

bottom. If it is not sufficiently agitated there is unequal distribution of particles in the vat, and there is consequently an unequal distribution of the lead in the spraying. The first trees receive too great a share, and the remaining trees too little.

A good way to overcome this is to provide a fair-sized circulating pipe, connected to the delivery pipe at the pump and between the pump and the cut-off taps where the length of hose connects. This pipe should be provided with a cut-off tap, and should lead back into the tank of the outfit. Before starting the pump this cut-off tap is opened and the first-mentioned taps closed, so that the mixture first taken up by the pump quickly passes back into the tank to be mixed by the agitator. After a few strokes, and when the mixture has been thoroughly stirred, the tap of the circulating pipe is shut, and spraying is started.

The first or calyx spray is of paramount importance in fighting the codlin moth. In seasons in which the weather is very varied apple and pear trees very often bloom irregularly, and there is often a wide gap between the first and the last bloom of individual varieties. Growers would be well advised to give such trees a double calyx spray.

When applying the first spray a good pressure is absolutely necessary, so that the spray will be forced into the calyx, and this must, of course, be before the calyx closes. The calyx of the apple tree closes more quickly than the calyx of the pear, so that it is sometimes advisable to give preference for the time being to the spraying of the former.

It is frequently advisable, too, to employ more than one pump at a time. Various factors may prevent the completion of spraying operations within an effective period of time. The orchard area may be extensive, weather may be unpropitious, and so, as time is the essence of the contract, and it is absolutely necessary to secure the best results, it is essential that all contingencies should be provided for.

The work done by one pump and its adequacy depend largely upon the efficiency of its outfit and management. If the sprayers have, for instance, to go long distances to and fro to fill the vat much time is wasted. Provision should be made to cart spray to the outfit and keep it well supplied.

It is not unusual to see one man spraying big trees in one row whilst another sprays small trees in another row. The first is tempted to slum his work in order to keep up with the second.

The calyx spray is put on chiefly as a wash, using a good force, and the following applications should be applied more as a spray. This can be done by holding the nozzle further from the tree. The number of applications will depend upon the variety of fruit treated, but not less than three applications must be made in accordance with the regulations.

A matter of very great importance in the early stages is the handpicking of infested fruit. This should be done thoroughly and systematically right through the orchard. The grub-infested fruit should be boiled or burnt as soon as possible after the grubs have entered. Destruction of the fruit in which the grub has found a home is no use as a preventive

if delayed until the grub has left. Early and vigorous action is necessary. Just as the early bird catches the worm, it is the early orchardist that catches the grub.

Delay in dealing with waste fruit is disastrous. It should not be allowed to accumulate in orchard or shed. If kept for any length of time the grub gets a chance to crawl out of the fruit and find shelter, where he awaits the next stage in his development.

Let me reiterate—Destroy *all* shelters. Destroy infested fruit whilst it *is* infested. Attend to these things early and often.

These operations may not secure immunity, but they will reduce and help to control infestation, with its consequent anxieties and losses.

The use of second-hand cases is another factor in encouraging the codlin moth pest. Grubs are carried in such cases and widely disseminated. Growers on the one hand may be fighting the pest, and on the other hand introducing or disseminating it by means of old cases, from which very often one has only to pull away a few boards to see to what an extent they are assisting in moth distribution. Many growers who use second-hand cases take the precaution to dip them in boiling water, but others fail to adopt this precaution. To be universally effective the practice should be universally followed. The case should be dipped for three minutes.

The packing shed and storage room should be thoroughly cleaned. If steam is available it is a big help. Many packing sheds could be made moth-proof.

In view of the large increase of the numbers of moths during the past few seasons, growers are advised to take every precaution to minimise the damage done by the pest by striking hard and often and thoroughly at its root—that is at the pest itself.

Orchard Drainage.

Land on slopes is liable to be washed away by heavy rains. The more thorough and cleaner the cultivation the greater the liability. Cartage and redistribution of soil will be necessitated, and this involves much labour. Prevention (according to the old adage) is better than cure, and so the grower will form surface drains to carry off surface water, which otherwise will carry much of his soil from higher to lower levels. Where surface wash is liable to occur, open furrows should be made to divert surface water from channels in which its action would be harmful into channels which will minimise its destructive effects.

Open channels must slope gently or they will soon deepen and widen into big channels. The grade of open surface channels should be gentle, so as to minimise erosion; at the same time such channels must be graded efficiently and located with judgment, so that they will carry the current of water through minor depressions and inequalities.

Provision of effective surface drainage is a work that is pre-eminently preventive of loss and damage, and merits the attention of all those who believe that "a stitch in time saves nine."—W. J. Allen and H. Broadfoot.

The Origin of the Granny Smith Apple.

Of locally-grown apples, none is more esteemed than Granny Smith—attractive both in appearance and flavour, and unexcelled as a keeper.

Evidence as to its origin has been collected by Mr. H. J. Rumsey, who, on 25th June, 1924, contributed an article to the *Farmer and Settler*, in which he wrote as follows:—

I have recently interviewed Mr. E. H. Small, a retired fruit-grower, now living at Burwood, and Mr. Harry Johnston, of Dundas, both of whom remember the original Granny Smith after whom "Granny's apple" was named. Though no actual dates are available, the memories of these two well-known fruit-growers coincide to a remarkable degree on the facts as I am here relating them.

"Granny" was the wife of Mr. Thomas Smith, of that part of Ryde now known as Eastwood. Mr. Smith had an orchard fronting the Great Northern road, down by the creek. One morning, in the year 1868, Mrs. Smith asked the late Mr. E. H. Small to look at a seedling apple that was growing down by the creek and to express an opinion about it. Mr. T. Small, then a 12-year-old boy, went down with them. The tree was growing among ferns and blady grass down by the creek, and had a few very fine specimens of apple on it. Mr. Small, senior, tested it critically, and remarked that it was a good cooking apple, and might be worth working from, though Mobb's Royal and several other good cookers seemed to fill the demand at that time. The boy, however, remarked that it was also a good eating apple, too, as he sampled it.

Mrs. Smith worked a few of the trees, and not long afterwards Mr. Edward Gallard, another member of the family, planted out a fairly large bed and marketed a crop annually from them up to the time of his death.

Mr. Small, senior, asked "Granny" how the apple came there, and she replied that she had brought some gin cases back from Sydney Markets which had contained the remains of some Tasmanian apples in them; these were rotting and she tipped them out down the creek. It is thought that Mrs. Smith mentioned that the remains in the cases were of French Crabs. The greasy skin and keeping qualities of the "Granny Smith" point to this being correct. There is no evidence as to the length of life of the original tree; in fact, Mr. Small thinks that the whole creek was cleaned up not long after the first orchards from it came into bearing.

"Granny Smith" proved a saleable cooking apple, but its value for dessert was not known until some fruit agents began storing a few cases away, and found that they kept better than any other varieties.

Mr. S. W. Webb, of Nana Glen (formerly of Bathurst), has stated, on the other hand, that he was under the impression that the apple in question was raised in the Bathurst district. The matter was lately referred to Mr. A. H. Benson, now Director of Fruit Culture in Queensland, but at one time Fruit Expert in the New South Wales Department. Mr. Benson replied as follows:—

The history of the Granny Smith apple is as stated by Mr. Rumsey in the *Farmer and Settler*. Although this apple was grown to a small extent in the Parramatta River district when I came to New South Wales in 1892, it was not grown outside that area to any extent, and I believe that the first planting, other than possibly individual trees, was made by me at the Government farm, Bathurst, in 1895, as I then recognised the value of this variety both for cooking and dessert purposes. The apple was certainly not raised in the Bathurst district.

In an article by Mr. Benson in the *Agricultural Gazette* of August, 1895, page 599, entitled "Fruits to Export and How to Export Them," the apple is referred to as "Granny Smith's Seedling—a New South Wales seedling raised from seed of the French Crab near Ryde, on the Parramatta River."

The above coincides with the information in the possession of the Fruit Expert, Mr. W. J. Allen.

Orchard Notes.

OCTOBER.

W. J. ALLEN and H. BROADFOOT.

ALTHOUGH some of the earlier blossoming varieties of apples and pears, especially in the coastal areas, have already been treated, the great majority of the varieties of those fruits will not be ready for the first application of lead arsenate until this month. Apple and pear growers will, therefore, be kept busy with the spray cart during the coming months. Spraying for codlin moth requires unremitting attention, but as treatment for the pest is fully dealt with in another article in this issue, there is no need to enlarge upon it here.

Spraying.

If the weather is favourable for black spot in apples and pears in districts in which this disease is prevalent, summer strength of either lime-sulphur or of Bordeaux mixture should be combined with the calyx application of lead arsenate. Although the respective merits and demerits of the two fungicides were discussed in a previous issue, it may be as well to state that apples and pears appear to be most sensitive to Bordeaux mixture at the calyx stage, and the use of that spray should be avoided, especially at this stage, except where it is absolutely necessary to employ it.

A close watch should be kept on peach, Japanese plum, and nectarine trees for the appearance of aphis, which should be promptly sprayed with tobacco wash or one of the commercial nicotine extracts. Use high pressure and repeat, if necessary, in two or three days.

Cultivation.

There is every indication of heavy fruit crops during the ensuing season, and close attention should be given to effective cultivation. It is impossible with our present knowledge of meteorological laws to forecast seasonal weather conditions, and the prudent grower will not run unnecessary risks. He will early commence to conserve soil moisture by use of the cultivator. Good cultivation is necessary to secure good crops of fine-quality fruit and to enable the tree to grow and to thrive, despite the drain made upon it. Not only have trees to carry and to mature a crop of fruit, but they have to prepare blossom buds for the following season.

The trees should be chipped around, and especial attention should be devoted to deciduous trees planted in the winter that has just ended, and still greater attention to recently-planted citrus trees. These are not yet thoroughly established, and may, if neglected, suffer from the short, dry periods which sometimes occur in spring. The soil around refills often dries rapidly, owing to the extraction from the soil of moisture by neighbouring trees that are well established. If loss of moisture is so great that the vitality of young trees is prejudicially affected, irrigation should be resorted to. If irrigation is not possible, a furrow should be opened around

the tree and into it a couple of buckets of water should be poured. When the water has soaked in, the furrow should be filled with the displaced soil.

Disbudding.

Stocks that have been grafted or cut back to buds inserted during the previous summer should be examined from time to time to see that growths from the stock do not sap the shoots from the buds or grafts. In the case in which the stocks are established trees which have been reworked to a fresh variety, it is well not to rub out all shoots from the stock, but to leave some of the weak ones merely pinched back so that they will afford shade for the stock until the head of the tree is formed.

Where scions of grafted trees have failed, leave a sufficient number of strong shoots from the stock to be budded later in the season.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Carcoar H. C. and A. Association	T. J. Brady	Oct. 15
Deniliquin P. and A. Society	P. Fagan	„ 15
Griffith A. Society	M. E. Sellin	„ 15, 16
Gundagai P. and A. Society	C. S. Dale	„ 29, 30
Lismore A. and I. Society	H. Pritchard	Nov. 18, 19, 20
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	„ 26, 27

1925.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 9, 10
Dapto A. and H. Society	E. G. Coghlan	„ 16, 17
Northern Suburbs A. & H. Association (St. Ives)	F. Conway	„ 16, 17
Kiama A. Society	G. A. Somerville	„ 24, 26
Wollongong A. H. and I. Association	W. J. Cochrane	„ 29, 30, 31
Yanco Irrigation Area A. Society (Leeton)	W. Roseworn	Feb. 10, 11
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	„ 13, 14
Guyra P. and A. Association	P. N. Stevenson	„ 17, 18, 19
Pambula A. H. and P. Society	L. K. Longhurst	„ 18, 19
Nimmitabel A. and P. Association	R. K. Draper	„ 24, 25
Uralla P. and A. Association	D. T. McLennan	„ 24, 25, 26
Newcastle A. H. and I. Association	E. J. Dann	„ 24 to 28
Blacktown A. Society	J. McMurtrie	„ 27, 28
Braidwood P. and A. Association (Jubilee Show)	R. L. Irwin	Mar. 3, 4, 5
Manning River A. and H. Association (Taree)	R. Plummer	„ 4, 5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	„ 5, 6, 7
Mudgee A. P. H. and I Association	R. Shaw	„ 10, 11, 12
Cobargo A. P. and H. Society	T. Kennelly	„ 11, 12
Batlow A. Society	C. J. Gregory	„ 17, 18
Crookwell A. P. and H. Society	C. H. Levy	„ 19, 20
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	„ 20, 21
Cooma P. and A. Association	C. J. Walmsley	„ 25, 26
Upper Hunter P and A. Association (Muswellbrook)	R. C. Sawkins	April 1, 2, 3
Royal Agricultural Society of N.S.W.	E. J. Raffety	„ 6 to 15
Gloucester A. H. and P. Association	F. S. Chester	„ 22, 23
Clarence P. and A. Society (Grafton)	L. C. Lawson	„ 29 to May 2

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Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

MAIZE FOR GRAIN AND GREEN FODDER, 1923–24.

Yanco Irrigation Area.

A. N. SHEPHERD, Senior Agricultural Instructor.

DURING the past season the following settlers co-operated with the Department in the carrying out of maize trials for grain :—

J. McCausland, Farm 333, Leeton.
A. Adams, Farm 518, Yanco.
A. Marshall, Farm 732, Leeton.
Todd and Beveridge, Farm 59, Leeton.

Although no large areas of maize were sown during the past season many settlers are beginning to realise the merits of this crop, not so much as a market commodity, but for its home uses, and in this way quite a fair quantity of maize was grown by local farmers. The dairy-farmer utilises the grain in conjunction with his skim milk to top off his pigs, thus producing a better class of baconer as well as turning out more pigs in less time. One settler estimates that he topped off £97 worth of pigs from 3 acres of maize in conjunction with skim milk, the maize in this case taking the place of pollard or other bought fodders.

The new settler with young fruit trees finds it profitable to sow a few acres with maize, usually using three or four rows between the rows of trees. He is thus able to get a return for his labour of cultivating the trees before they become productive, and it has been noted that the protection afforded the young trees from the hot winds by the maize greatly assists their growth. On farms where this practice is adopted the grain is usually made use of for feeding pigs, horses or poultry.

The past season was favourable to the growth of maize. Whilst odd heat waves were experienced, helpful showers fell throughout the season, and the hot, dry winds were not as prevalent as in past years.

The rainfall registrations during the growing period at Leeton were as follows :—December, 161 points; January, 79; February, 298; March, 88; total, 626 points.

The Plots.

Farm 333.—A variety trial was sown here on 6th December, 1923, on new land consisting of a red sandy loam. The land had been fallowed during the winter, 1923, and had received workings during the spring. Furrows were struck 3 feet apart, and the grain was hand-dropped at the rate of three every

3 feet; superphosphate was added at the rate of 70 lb. per acre. A very good germination was obtained and the plants made satisfactory growth The crop was watered once in each month, in January, February, an ' March Early Mastodon produced cobs of fair size, but the grain was not attractive; it was pinched and did not fill like the other varieties. Iowa Silvermine gave the heaviest return, of good quality grain, the depth of grain of this variety being very good.

Farm 518.—Several new varieties figured in the trial carried out on this farm. The land consisted of a red loam fallowed during the preceeding winter. It was sown with the maize dropper on 19th December in rows 3 feet apart at the rate of 12 lb. of seed per acre, superphosphate at the rate of 70 lb. per acre being applied at the same time. Except in the case of Silvermine, good germination was obtained. The crop received waterings in the middle and at the end of January, and early in March. Of the new varieties, Auburn Vale Hogan, a red maize, gave encouraging returns; the cobs were of good size with nice even grain. Funk's 90-day was the tallest grower in the trial; the grain was very similar to Funk's Yellow Dent, except that there was a pale cap to the top of the grain. Gold Coin gave rather large cobs of unattractive grain.

Farm 732.—The variety trial at this farm was sown on grey soil, on land that had been fallowed in the winter of 1923, and sown in early spring to Sudan grass, which failed to germinate. The land was then disced following a watering. It was sown on 20th December, the seed being dropped by hand at the rate of three grains every 3 feet in plough furrows 3 feet apart; a dressing of 70 lb. superphosphate was also applied. Eureka, a variety that gave good returns last season, again gave promising results. From Coodra Vale the yield was very disappointing. The crop received in all three waterings.

Farm 59.—A manurial trial with Golden Superb was conducted on this farm on red clay loam. The seed was sown with the maize planter on 12th December in drills 3 feet 6 inches apart, using 15 lb. of seed per acre. The germination was fair, but the growth poor. The crop received four waterings. The results were very disappointing, in view of the encouraging returns from this variety the previous season. The yields were as follows :—

Fertiliser per acre.	Yield.	
M13, 91 lb.	30 bus.	36 lb.
M14, 112 lb.	27 „	23 „
Superphosphate, 70 lb.	23 „	34 „
M4, 98 lb.	22 „	7 „

M13 mixture consists of three parts sulphate of potash and ten parts superphosphate; M14, of three parts sulphate of potash and five parts superphosphate; M4, of five parts superphosphate and two parts sulphate of ammonia.

RESULTS of Variety Trials.

Variety.	Farm 838.	Farm 518.	Farm 732.
	bus. lb.	bus. lb.	bus. lb.
Iowa Silvermine	46 8	34 17	27 16
Early Mastodon	38 34	....	....
Funk's Yellow Dent	34 32	38 10	30 32
Early Red Hogan	26 28	....	....
Auburn Vale Hogan	....	42 14	....
Wellingrove	....	41 10	31 36
Gold Coin	....	41 7	....
Funk's 90-day	....	38 0	....
Eureka	....	....	39 16
Golden Superb	....	....	25 32
Coodra Vale	....	....	23 27

Central-western District.

W. D. KERLE, Senior Agricultural Instructor.

The great improvement made in maize-growing in this State in the last few years has not been confined to that portion eminently suitable for its production, namely, the coastal districts, but it has also been apparent in districts of high altitude not hitherto regarded as capable of producing maize on a commercial scale. This has been accomplished through the introduction by the Department of very early maturing varieties from the Northern United States of America. Experiments conducted at various centres in the Central Tableland district with these varieties have shown their superiority over existing ones, particularly in earlier maturity, quality of grain, and yield. Very satisfactory results were obtained last season in trials conducted with farmers in localities with altitudes ranging from 2,100 to 3,600 feet.

The area sown with maize in the Central Tableland in the 1923–24 season was nearly 6,000 acres, and the yield above the average. Such yields can hardly be compared with those of the coastal districts, the average yield of which is probably more than double that of the Tableland, but the latter is produced on land of one-tenth the capital value.

Experiments were sown at Huntley, Tarana, Neville and Coonabarabran. Conditions were not favourable at the commencement of the season to early sowing, which operation was delayed too long at Coonabarabran and Neville, where the crop was partially destroyed by frost as a result, and comparable results were unobtainable.

The trial at Huntley, which is 3,067 feet above sea-level, was conducted by Mr. J. C. Ironmonger on a red clay loam soil, which had previously been cropped with wheat for hay. It was ploughed 6 inches deep early in August, harrowed and cultivated in October, and sown on 29th November with the maize dropper in drills 5 feet apart. Germination was excellent. When the crop was 2 to 3 inches high it was harrowed, and when 2 feet high was cultivated between the rows. The rainfall recorded during growth was 7·78

inches, distributed as follows :—December, 120 points; January, 56; February, 346; March, 72; April, 184. Several varieties had matured before the April fall. A slight frost in December did not affect the crop seriously, but three consecutive frosts in the third week in April cut the crop down. This did not harm five of the varieties, which at this stage were mature, but cut Iowa Silvermine and Funk's Yellow Dent. This was unfortunate, as these two varieties were 8 feet in height and heavily cobbed. Sown earlier, these varieties in a normal season would mature in this district. When ripe Wellingrove and Golden Glow were nearly 7 feet high, Early Morn and Canada Flint 5 feet, and Sundown 4 feet.

A plot that received a dressing of superphosphate at the rate of 2 cwt. per acre was sown alongside an unmanured plot of Early Morn, Canada Flint and Sundown, and gave substantial increases in yield. The results obtained were as follows :—

Variety.	With 2 cwt. superphosphate per acre.		Without superphosphate.		Increase due to superphosphate.	
	bus.	lb.	bus.	lb.	bus.	lb.
Golden Glow	....		46	18	....	
Sundown	48	24	44	8	4	16
Early Morn	51	36	43	4	8	32
Wellingrove	....		40	0	....	
Canada Flint	46	16	39	48	6	24

Mr. A. W. Perry conducted the trial at Tarana, which was one for fodder only. It was sown on 21st November on a poor quality granite soil, previously cropped with potatoes.

The ground was ploughed in June, 1923, springtoothed in early spring and again just before sowing, when the seed was dropped at the rate of three grains every 2 feet 6 inches in 4-feet drills. The season was a very favourable one for maize in this locality. Half of each variety was fertilised with superphosphate at the rate of 1 cwt. per acre and the other half unmanured, resulting in every case in an increase in yield of the former.

The yields of green fodder obtained were as follows :—

Variety.	With 1 cwt. superphosphate per acre.				Without superphosphate.				Increase due to fertiliser.		
	t.	c.	q.	lb.	t.	c.	q.	lb.	c.	q.	lb.
Iowa Silvermine	4	0	2	0	3	10	2	0	10	0	0
Golden Glow	4	0	1	0	3	7	1	0	13	0	0
Funk's Yellow Dent	3	10	1	0	3	2	0	0	8	1	0
Early Mastodon Whitecap ...	3	10	0	0	2	2	0	0	8	0	0
Hickory King	3	6	0	0	2	7	2	0	18	2	0
Wellingrove	3	2	1	0	2	12	1	0	10	0	0
Sundown	3	1	0	0	2	4	1	0	16	3	0
Early Red Hogan	3	0	0	0	2	13	1	0	6	3	0
Early Morn	2	18	2	0	2	10	0	0	8	2	0
Local Yellow Dent	2	12	1	0	2	2	1	0	10	0	0
Golden Superb	2	6	2	0	2	2	1	0	4	1	0

Mr. George Grant, "Sarilla," Shaw, at the foot of Mt. Macquarie, sowed on a red loam soil on 25th October, 1923, six varieties forwarded for trial by the Department. The germination and growth of all varieties was most satisfactory, the season being a favourable one, its only drawbacks a frost in November and trouble from Rutherglen bug in January. The locality is some 3,000 feet above sea-level, but all the varieties matured thoroughly, some excellent cobs, particularly of Golden Glow, Early Morn and Wellingrove, being obtained.

The estimated grain yields were as follows:—

Variety.	Yield per acre.	Variety.	Yield per acre.
Wellingrove ...	50 bus.	Sundown	32 bus.
Golden Glow ...	45 „	Minnesota No. 33	22 „
Early Morn ...	45 „	Early Canada Flint	12 „

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

During the last maize-growing season experiments were carried out with maize and cowpeas grown together in the proportion of 5 lb. of black cowpeas to 30 lb. of Fitzroy maize per acre. As this mixture has already proved a valuable one as far as the needs of the dairy-farmer are concerned, either in the way of green fodder or silage, it was decided to test the effect of fertilisers on the yield. The following farmers co-operated with the Department in the experiments:—

Morton Bros., Nowra.
Wm. Cox, Kangaroo Valley.
G. H. Faulks, Moss Vale.
A. Louttit, Moruya.
L. B. Garrad, Milton.
J. Timbs, Albion Park.
Superintendent, Boys' Farm Homes, Mittagong.

The spring was dry, and in several districts the crops suffered severely on that account, as they made little headway after germinating. This largely accounts for the poor returns. Unless there is sufficient soil moisture for satisfactory growth, artificial manures may tend rather to force the crop to early maturity, whereas without manure it might remain at a standstill, going rapidly ahead, however, when bountiful rain falls. Many farmers, not used to artificial manures, are apt to get the idea that they do damage, but by careful experimental work, carried out over a number of years, the benefit of suitable applications of different manures can be fully demonstrated. The past season certainly was not favourable in most districts, the manures failing to produce results approximating to those of other seasons. One feature, even in an unfavourable season, is striking—the results obtained from superphosphate alone, which show to advantage against other sections at most

centres. The mixtures M5 and M13 each contains superphosphate, M5 being composed of one part sulphate ammonia, two parts superphosphate, and M13 of three parts sulphate of potash and ten parts superphosphate.

The yields were as follows:

Fertiliser per acre.	Nowra.	Kangaroo Valley.	Moss Vale.	Moruya.	Milton.	Albion Park.	Mittagong.
Planted ...	22nd Nov.	30th Oct.	13th Nov.	3rd Nov.	9th Nov.	9th Nov.	8th Nov.
Harvested ...	7th Mar.	29th Mar.	2nd April	26th Mar.	27th Mar.	1st Mar.	15th April.
Rainfall ...	11·25 in.	*	13·12 in.	20·16 in.	15	17·04 in.	*
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate 140 lb.	13 0 1 18	13 11 1 20	16 16 0 26	25 2 3 12	16 14 1 4	9 5 2 24	8 0 0 0
No manure .	13 13 0 4	10 1 1 20	13 7 2 20	20 0 0 0	13 2 3 12	8 4 1 4	2 7 0 16
M5, 210 lb. .	10 18 0 4	11 17 0 16	15 1 0 24	24 0 0 0	16 17 0 16	9 1 1 20	3 18 2 9
M13, 182 lb. ...	12 3 2 8	9 1 1 20	17 18 1 24	22 10 0 0	14 12 3 12	8 7 0 16	7 10 0 0

* Not available.

North-western District.

MARK H. REYNOLDS, Senior Agricultural Instructor.

THE following farmers co-operated with the Department in experiments with maize last season:—

- H. A. Sternbeck, Mt. Ethel, Inverell.
- J. Nash, West Tamworth.
- E. Wilcox, Armidale.
- R. Fulthorpe, Kentucky.
- J. Chick, Tenterfield.
- H. Manser, Tenterfield.
- W. G. Geyer, Tenterfield.

Details of Plots.

Inverell.—Plots located on gently undulating uplands, soil a red loam; cropped with wheat in 1922, when superphosphate at the rate of 52 lb. per acre was sown with the grain. The wheat was harvested for grain by stripping, and the remaining straw was partly consumed by cattle. The land was ploughed about 4 inches deep in February and twice springtooth-cultivated by the end of July. Self-sown oat plants, thinly distributed, made an appearance at the end of August, and a further springtooth cultivation was given on 12th September both ways. The land was harrowed prior to sowing. The seed was ploughed in about 3 inches deep in furrows 4 feet apart, three grains being dropped every 3 feet. The variety trial was sown on 8th October, and the manurial trial on 13th October. The crop was free from noticeable damage by insect or fungus pests. The quality of the grain harvested was satisfactory, except that of Early Mastodon Whitecap. King of the Earlies is not the earliest maturing maize. A drawback with this variety is the small cobs, which necessitate additional labour in harvesting.

The results of the variety trial were as follows:—Wellingrove, 32 bushels; King of the Earlies, 31 bushels; Auburn Vale, 39 bushels; Funk's Yellow Dent, 29 bushels; Mastodon Whitecap, 30 bushels; Eureka, 33 bushels.

The results of the fertiliser trial (with Iowa Silvermine) were :—From 99 lb. superphosphate per acre, 35 bushels; 148 lb. M5* per acre, 35 bushels; 129 lb. M13 per acre, 31 bushels; no manure, 29 bushels.

Tamworth.—These plots were situated on the Peel River flats, the soil being a deep alluvium. The land is still subject to flooding, but only on exceptional occasions, the last inundation being in 1910. Prior to this date and since, the land has been down to lucerne. The condition of the stand was thin and weedy at the time of ploughing for this trial. No fertiliser has been added to the soil at any time for the past twenty years. Commencing 6th August, the land was ploughed 6 inches deep, and a further ploughing to a depth of 8 inches was carried out on 15th September. About 2 inches of rain fell between the ploughings. After each ploughing the land was harrowed. The seed was sown on 6th October in a moist soil of fair tilth, and a good stand was obtained. In all varieties good vegetative growth resulted, but the dry and at times hot conditions until the latter part of December caused a low production of cobs and in some instances light setting of grain. As the yield was estimated at under 10 bushels to the acre from the best variety, the result was not considered of value, and the experiment was abandoned.

Armidale.—The location of the plots here was somewhat level; the soil consisted of a black clay loam of basaltic formation, which is typical of a considerable area of country about Armidale. Clover occupied the land for the two previous years; no fertiliser has been added to the soil. The land was ploughed about 5 inches deep toward the end of July, early in September and at the end of October, then harrowed and cultivated with a springtooth cultivator. The seed was sown on 3rd November, but owing to dry conditions, cutworms, &c., a thin and uneven stand resulted, with poor setting of cobs, and the crop was converted into silage.

Kentucky.—The plots were located on gently undulating uplands, the soil a greyish to red sandy loam. On the land on which the variety trial was located the previous crop was self-sown oats (unmanured), which were fed off; where the manurial trial was located the land had been previously occupied with potatoes (also unmanured) in 1922. Cultivation of the variety trial section in preparation for the experiment consisted of a 7-inch ploughing in April, 1923, no further cultivation being given until 4th October, when a further ploughing was carried out, followed by a harrowing just prior to seeding. The manurial section was ploughed 8 inches deep in the latter part of July, harrowed, again ploughed 4 inches deep on 10th October, and harrowed just prior to sowing. The seed in both trials was sown on 18th October in rows 4 feet apart; in the variety trial the grains were spaced about 15 inches apart, and in the manurial trial three grains were dropped every 3 feet. Few weeds grew during the cultural period, but in the manurial

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*The make-up of the different fertiliser mixtures mentioned in this article is as follows :—M5, sulphate of ammonia 1 part, superphosphate 2 parts; M13, sulphate of potash 3 parts, superphosphate 10 parts; M11, nitrate of soda 1 part, superphosphate 2 parts; M8, sulphate of ammonia 4 parts, superphosphate 5 parts; M4, sulphate of ammonia 2 parts, superphosphate 5 parts.

trial a fairly thick self-sown crop of potatoes grew and developed. The order of maturity of the varieties was :—Early Morn, 28th March; Golden Glow, 12th April; Wellingrove, 22nd April; Gold Coin, 30th April. All varieties were free from disease and the grain was of good quality.

The results in the variety trial were as follows :—Wellingrove, 37 bushels; Early Morn, 13 bushels; Golden Glow, 33 bushels.

The results of the fertiliser trial (with Gold Coin) were :—From 75 lb. superphosphate per acre, 50 bushels; 96 lb. M13, 46 bushels; 111 lb. M11., 44 bushels; 136 lb. M8, 51 bushels; 107 lb. M4, 70 bushels; unmanured, 34 bushels.

Tenterfield (J. Chick).—This experiment was located on a southerly slope, the soil a grey sandy loam. The previous crop was maize, in 1922. Cultural operations consisted of a ploughing and two springtine cultivator stirrings prior to sowing, on 10th October. Good quality grain was harvested early in April, and the crop was free from disease.

The results of the fertiliser trial (with Golden Glow) were as follows :—From 62 lb. superphosphate, 24 bushels; 53 lb. M13, 24 bushels; 74 lb. M11, 22 bushels; 74 lb. M8, 26 bushels; 67 lb. M4, 26 bushels.

Tenterfield (H. Manser.)—Situated on uplands, sloping gently to the east; soil a sandy loam of granitic origin. The previous crop was oats (unmanured) in 1922. Cultural operations consisted of a 6 to 8 inch ploughing in July and again early in October, the land being harrowed after each ploughing. The seed was sown on 22nd October and the crop was fit to harvest about the end of April. The several varieties were free from disease and good quality grain was obtained from each.

The results of the fertiliser trial (with Funk's Yellow Dent) were :—From 70 lb. superphosphate, 27 bushels; 88 lb. M13, 24 bushels; 106 lb. M11, 25 bushels; 124 lb. M8, 33 bushels; 97 lb. M4, 30 bushels; unmanured, 30 bushels.

Tenterfield (W. G. Geyer).—The plots were located on an upland soil of a sandy nature, the country sloping to the north-west. The previous crop was Sudan grass, sown in drills 2 feet 9 inches apart in 1922, and unmanured. Prior to this crop the land had been covered with couch grass for some years. Cultivation consisted of a 5-inch ploughing in June, harrowing just prior to second ploughing, and a ploughing in mid-September. The crop was sown on 20th October; a fertiliser consisting of superphosphate 5 parts and sulphate of ammonia 4 parts was applied at the rate of 68 lb. per acre at the time of sowing. Owing to the uneven stand and growth the result was not considered comparable.

General Comments.

In the Inverell and Armidale sections early sowings were the lowest yielding. Sowings from the middle to the end of November produced the best yielding crops about Inverell; later sowings there and at Armidale were damaged by early frosts. The rainfall during the spring and until late

in December was light at both Inverell and Armidale. At Walcha and about Llangothlin, Guyra, and Ben Lomond yields up to 70 bushels per acre were obtained. Gold Coin at Armidale, Wellingrove at Walcha, Armidale, and Glen Innes, Early Morn and Golden Glow at Guyra and Ben Lomond, and Golden Glow, Golden Superb, Funk's Yellow Dent and Wellingrove at Tenterfield were among those varieties which yielded most satisfactorily.

RAINFALL during the Growing Period.

Locality.	October.	November.	December.	January.	February.	March.	Total.
	Points.	Points.	Points.	Points.	Points.	Points.	Points.
Inverell	191	61	387	222	654	...	1,535
Kentucky	111	134	410	359	812	37	1,863
Tenterfield	83	12	263	324	402	134	1,218
Armidale	...	98	262	238	497	106	1,201
Tamworth	82	12	263	242	445	...	1,044

FERTILISER TRIALS WITH MAIZE FOR SILAGE.

TRIALS to determine the most profitable fertiliser or mixture of fertilisers to apply with maize grown for silage were again carried out at Yanco Experiment Farm last season, terminating an experiment which has extended over four years. Reviewing the results obtained during that period, it appears that applications of superphosphate up to 280 lb. per acre have given beneficial returns. A combination of 140 lb. of superphosphate and 56 lb. of sulphate of ammonia per acre has given, for the period, an increase of approximately 10 cwt. per acre over 140 lb. superphosphate alone. This was on a soil poor in organic matter. Tests will be conducted this season to ascertain whether similar results are obtained from the use of sulphate of ammonia with the heavier dressing of superphosphate. In no year did muriate of potash give an increase commensurate with its cost. In the case of a complete manure also, the cost of the fertiliser exceeded the value of the resultant increase in yield. The average (approximate) yield from the unmanured plots for the period was 12 tons 10 cwt. per acre. From the area dressed with 280 lb. superphosphate per acre it was approximately 14 tons.

THE WHEAT-BREEDER'S PROBLEM.

FOR the plant-breeder the most important problem of the main wheat belt is the production of varieties resistant to flag smut. Distinct progress has been made during the year to this end. Rigorous tests at Bathurst Experiment Farm have indicated at least one introduced variety to be resistant, under the conditions of the years 1922 and 1923. This variety is not suitable for New South Wales conditions, but it has been extensively crossed with the best local varieties. While it will be several years before locally-adapted resistant types can be looked for, it is probable that the first important phase of the problem has been passed.—J. P. SHELTON, Plant Breeder.

The dipping of sheep should be part of the routine management of every sheep farm.

AN INTERESTING WHEAT TABLE.

IN 1923–24, statistics were collected for the first time of the yield of wheat from areas of new land, fallowed land, and unfallowed land. It was intended (writes Mr. H. A. Smith, Government Statistician) that the land should not be classified as fallow unless it had not been cropped for at least twelve months, but it is doubtful if this rule was generally observed in collecting the information. The results are compared in the following statement, the figures being exclusive of areas which failed entirely:—

Class of Land.	Area.	Yield.	
		Total.	Average per acre.
	acres.	bus.	bus.
New	86,309	894,288	10·4
Fallowed	1,306,721	18,495,399	14·1
Stubble	1,412,971	13,651,164	9·6

FOOD PRODUCTION FOR THE FARM.

CAREFUL estimates show, says Finley P. Mount, in the *Farm Equipment Dealer*, that of a total cash expenditure of 7,270,000,000 dollars in 1923, the American farmer spent close upon 2,000,000,000 dollars on food. "Can the farmer's overhead charges be cut here?" he asks. "It would seem so. In view of the fact that the farm is primarily a food factory, one would hardly expect food to constitute the biggest item of cash expense. But our surprise over this figure is lessened when we note by the census returns that there are more than 24,000 farms in North Dakota alone without a single milk-cow—that is to say, about one-third of the farms in that State are either buying butter and milk or doing without. What has become of the ways of our fathers, when all the family meat, all the dairy products, all the fruits (except tropical), all the vegetables, all the bread for the farm family were, as a matter of course, produced on the farm itself?"

It is a question that might well be addressed to many farmers in New South Wales.

"THE NEW INDUSTRIAL ERA."

IN "The New Industrial Era," Sir Charles Macara, Bart., assembles in book form some views on various aspects of an industry upon which he would appear to be peculiarly well qualified to speak. The matter is a reprint of addresses, papers, articles, and so forth, and their author a well-known figure in the Lancashire cotton trade, with which the contents of the book are primarily concerned. The material has been marshalled under the headings, "A Pillar of Empire," "The Control of the Cotton Industry," "The Future of Cotton," "Education in Industry," "The Freedom of Trade," and an appendix. An interesting work to a certain section of readers, but with a limited appeal for the average local farmer. Our copy from the author.

Oats and Sheep.

J. T. PRIDHAM, Plant Breeder.*

WHEAT and sheep have been a profitable combination in the wheat-growing districts of New South Wales, and oats have usually been grown merely as a change crop after wheat for the combat of take-all. The object of this paper is to show that oats are capable of supporting more sheep on a given area than wheat, and in the programme outlined the sheep become the main objective. The wheat would then be regarded as a necessary adjunct to sheep-raising and a means of utilising the plant and horses during the year and paying expenses.

In view of the high prices (and prospective high prices) for wool and the steady market for fat lambs, whether for export or home consumption, it is suggested that oats and sheep, in conjunction with wheat, can be made even more profitable than wheat and sheep alone. In the first place, the oat crop yields more to the acre than wheat. Secondly, oaten straw is more nutritious than wheaten, and the oat grain contains much more fat than wheat. In fact, for the inland farmer oats may be regarded as an ideal ration for sheep; in districts where maize grows well this might take the place of oats, though the maize crop is somewhat expensive to handle unless made into silage, for which it is admirably suited. Thirdly, the subdivision fencing into reduced areas for grazing is conducive to better farming and to facility in handling the sheep, which become quiet and docile. The work of attending the ewes during lambing is thus made easier.

Grazing will be the main mode of feeding, and hay may be fed in the sheaf if one is starting in a small way, but it will be found more economical to chaff it for the sheep as well as horses. The bag feeder is effective and cheap. A post is erected at each end of the proposed trough, which consists of superphosphate bags sewn together lengthwise. At intervals of 4 to 5 feet stakes or iron droppers are driven, and through the droppers and edges of the bagging a wire is threaded and secured to the posts at the end of the trough. The wires should keep the bags 3 inches off the ground, and a third wire is an advantage threaded along the bottom of the feeder to prevent wind blowing the chaff away. Liberal supplies of salt and water should be available.

The advantage of this proposition is that the fertility of the land is maintained and even improved, superphosphate being used with the cereals, because most of the valuable constituents of the crop are returned to the soil by the sheep. This cannot be said of wheat-growing alone, which is a

* Paper read at a meeting of the Australasian Association for the Advancement of Science, held at Adelaide during August, 1924.

continual drain on the producing power of the soil, restored only in part by the limited number of sheep carried.

With the early-maturing varieties of oats we now have, such as Sunrise, Mulga, and Lachlan, we can grow abundance of feed for winter grazing, and ewes will be in fine condition by lambing time. Oats fed off thus will provide plenty of fodder till the lambs are fattened and sold. We have at Cowra Experiment Farm at present a paddock of Sunrise oats, sown the first week in April (previous season under wheat), which has been constantly fed off, and now will give a heavy and even crop if shut up for hay. Algerian oats could not have done it in the time. Sunrise or Mulga are suggested for early grazing, and Lachlan to sow later for a hay crop. This would suffice, with stubble picking, to carry the sheep on until the following year's grazing crop is ready. A better plan is to cut a proportion for silage and put it in a pit.

A Suitable Rotation.

It may be desirable to feed off the wheat crop once. Take, for instance, a farm of 600 acres. This might be divided into 150 acres grass, horse paddock, homestead, &c.; 100 acres wheat; 100 acres oats; 200 acres fallow, and 50 acres miscellaneous crops. The rotation would thus be: First year, wheat; second year, fallow; third year, oats and peas or oats only; fourth year, fallow. The carrying capacity for sheep would vary according to the rainfall, but in the Cowra district a farm of this size would easily carry 500 to 600 breeding ewes in an average year. Miscellaneous crops would include rape, barley, Sudan grass, and summer fodders. Rape is one of the best fodders for sheep, but is a failure in the absence of good January rains. Peas are a valuable crop, and it is recommended that they be sown with the oats as a mixture, choosing an early variety. The value of peas as a balanced ration with oats is indisputable, and they have a further advantage in maintaining the fertility and healthy action of the soil, which would become oat-sick before long with continuous cropping. The area of oats harvested for hay might consist of a mixture, too, leaving the crop till fairly ripe before cutting. The sheep will pick up the shed peas and do well on the stubble, while horses will relish the pea and oat mixture as chaff. I understand in Western Australia sheep are fattened on oats and peas ripened off in the paddock; they will not eat the peas in a green state to any extent.

Summer crops, as a rule, should be sown very sparingly in the western areas of New South Wales, because one is not making the best use of the rainfall in growing crops during the summer, when evaporation is very high from the leaf surface and soil. Crops raised in the cool months of the year make for maximum production, and peas and oats are as good a mixture as we have at present. In the coastal districts and where summer rains are heavy the position is different: here maize and summer fodders

should be grown. Lucerne is the king of fodders, but will it pay the farmer in the main wheat belt to grow it unless he has alluvial flats or a river or creek frontage? On upland soil lucerne often does surprisingly well, but the bulk of fodder grown will not as a rule compare with oats, and it does not pay to have the land lying out under lucerne on a comparatively small holding. If a farmer has even 5 acres of land where the roots can reach underground water he would be foolish not to grow lucerne.

It is assumed that two varieties of oats will be grown, an early and medium-early sort, and one variety of wheat. Selection of the seed and the growing of stud seed every year on the farm is strongly advised. To get the best results in these days of competition we cannot afford to grow anything but the best, whether crops or stock. The best plants from the cereal crops should be selected and the bulk gradually increased, so that each year one is keeping up a supply of high-yielding seed to sow the farm. It would be advisable to grow one's own pea seed, too; a single variety would do. Canadian and some early American varieties are good. Tangier pea and an early crossbred produced by the Department are as good as any, but seed is not yet on the market. Pea-growing, except table peas for the city, does not seem to have taken on up to the present. In sowing a mixture of oats and peas, the oats have been found to outgrow the peas, so that when the crop is fit to use they are almost smothered, the proportion of oats being too large. At Wyoming, U.S.A., the practice of sowing the peas pretty deeply in well-worked soil has been tried, following with a shallower sowing of oats ten days or a fortnight later. This has been successful in producing an even mixture of oats and legume, the peas getting a good start before the oats; 20 to 30 lb. of each is sown, the fertiliser going in with the peas. Experience will show the best mixture to use. At Cowra 25 lb. oats and 20 lb. peas sown as a mixture have been found satisfactory, with ½ cwt. or more of superphosphate, sowing early in April. The sowing may extend from the latter end of February well into the month of May.

Pasture improvement is still a matter for pastoralists; the farmer on a small holding cannot afford to go in for it, as his grass paddock is wanted to run his sheep on in wet weather and when feed is scarce in the cultivation paddocks. Under these circumstances the best grasses will not be fostered.

Barley is admirable for early feed, but the drawback to this crop is that it seldom makes a second growth after grazing, and the soil must be in very good condition to get a good crop. Oats, on the other hand, will grow a crop when the soil is poor and will stand more adverse weather than barley. Sudan grass and summer fodders are very naturally the basis of the dairy ration on the coast, but they do not supply winter and spring feed unless conserved in the form of silage. This entails considerable labour and expense if employed on such a scale as to dispense with autumn cereals.

The Sheep.

There appears to be no valid reason why good wool as well as fat lambs should not be produced on a farm: a large area of country is not necessary, though it is quite true that the best quality of Merino wool is impossible on a farm because of the dust and grit inseparable from the use of cultivation paddocks.

The ewe favoured by the Department is the Border-Leicester x Merino, a cross which will cut a good fleece, and when mated with a Ryeland, Romney, or Dorset Horn ram will throw early-maturing lambs. The plan is to maintain a flock of these ewes until they do not pay to keep for breeding, selling all the lambs each year. By mating the ewes in January and February, the lambs are dropped from June to August, according to the district, and marketed at the end of the year or later. The ewes and lambs would be carried chiefly on the green crop, with silage or chaff when no green feed is on hand; 2 lb. oaten chaff a day will keep a ewe and lamb, while 1 lb. per day will keep a sheep in store condition. After the lambs are sold the ewes would be turned on to the stubbles. Subdivision fencing should be of a temporary character, to be put up and taken down when necessary. Only in this way can a crop be grazed to the best advantage, changing the animals from one section to another as they become fed off.

Australia produces far more wheat than oats. In Canada the reverse holds good, and although Canada grows so much oats, her export of wheat is much larger. The bulk of her oats goes to feed livestock in the winter. In our wonderful climate a minimum of hand-feeding is necessary, but that does not imply that we are wise in relying on natural pastures alone on that account. Our sheep can graze the greater part of the year if crops are provided, the only periods of hand-feeding being during wet weather or when the paddocks are bare. Under such favourable conditions, the only drawback being limited rainfall, stock-raising must become more general as the holdings are reduced in size. Beginning with squatting pursuits and large sheep runs, settlement and production has found an outlet in large wheat farms; we are now approaching the next phase of rural industry, which appears to consist of smaller farms for stock and crops or a more diversified character of production. A wheat-farmer usually sows a certain area of unfallowed land as a speculation. Under the above system fallowed land only would be used, making the returns more or less a certainty. Should the grower, after trying this proposal, decide to return to wheat and sheep under the old methods, he will find the land in far better condition than when he started.

Winter Fodders.

Winter fodder trials have been carried out on some of our departmental farms to determine the best crop for winter grazing and soiling. Results

from two farms are given below, the one in country considered too dry to be safe for wheat-growing (Nyngan), and the other in a good mixed-farming district (Cowra):—

NYNGAN Experiment Farm.

	1915.	1916.	1917.	1918.	1920.	1921.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Wheat	1 12	4 6	0 14	1 1¼	8 8¼	4 11¾
Cape barley	not sown.	3 14¾	0 11¾	1 9½	7 13⅛	not sown.
Skinless barley	0 15	2 14	1 0⅞	0 14¼	7 19	6 4¼
Rape	failed.	14 5	failed	failed.	failed.	11 2¾
Sunrise oats	1 8¼	5 11⅞	1 8	1 13¾	8 6¼	8 1⅝
Algerian oats	not sown.	7 1⅔	0 19¾	1 9½	5 17½	not sown.

COWRA Experiment Farm.

	1921.	1922.	1923.
	t. c.	t. c.	t. c.
Sunrise oats	11 6	10 18	not sown.
Sunrise and Firbank ..	not sown.	8 14	9 0
Wheat	4 8	6 7	9 9
Rye	8 19	8 5	7 14
6-row barley	9 5	10 14	7 0
Sunrise and 6-row barley...	not sown.	10 2	5 13
Rye and peas	not sown.	8 9	5 9
Skinless barley	5 0	6 12	2 1
Algerian oats	10 12	not sown.	not sown.
Rape	5 14	not sown.	not sown.

At Nyngan, in 1919, 1922, and 1923, the trials were complete or partial failures from drought. In two years out of six wheat out-yielded Sunrise oats by a small margin only. At Cowra, 1923 was unfavourable for grazing, as often happens when germination is delayed through insufficient moisture at seeding time. The farm crops that year, however, were very good.

Those who have been accustomed to a large area of country have a rooted objection to hand-feeding. If once resorted to, it is said, the sheep hang about the feeders and will not forage for themselves so well afterwards when the fodder is withdrawn. This holds good in regard to dry grass paddocks, but with succulent crop grazing there is not much in the objection, and it pays to hand-feed if only to save a break in the wool, to say nothing of the fattening aspect of the question.

COLD westerly winds in September, 1923, made it necessary to feed stock throughout the spring. The condition of the dry stock fed on silage made from paspalum and cured in the stack was ample testimony as to the value of that fodder.—C. G. F. GRANT, Manager, Government Experiment Farm, Berry.

Inverell Maize-growing Contest, 1923–24.

The object of the maize-growing competition conducted by the Inverell P. and A. Association is to determine the highest yielding variety or strain of variety suitable for the Inverell district. There were twenty-one entries, including six non-competitive entries by the Department, this season, sowings of each variety being carried out on the farms of Messrs. E. A. Cosh, Mount Russell, and H. Ditzell, Inverell.

The soil on the first-mentioned property consists of a black basaltic clay loam, which was ploughed 4 inches deep and harrowed during February, and reploughed and harrowed during May. The seed was ploughed in 2½ inches deep on 26th and 27th September, a satisfactory germination resulting. The rows were springtooth-cultivated during the first and last weeks in October. The rainfall during the growing period was as follows:—October, 190 points; November, 35; December, 283; January, 155; February, 290; total, 953 points. The early varieties did not benefit by the late rains, as they ripened in January.

The soil on Mr. Ditzell's farm consists of a clay loam, which was ploughed on 7th August, and reploughed and sown on 28th September. The rainfall during the growing period was as follows:—October, 191 points; November, 61; December, 389; January, 182; February, 654; total, 1,477 points.

Averaging the yields on both farms, the results were as follows:—

Variety.	Yield per acre. bus.	lb.
Auburn Vale Hogan (Department of Agriculture).	37	33
Kennedy (Department of Agriculture).	34	20
Iowa Silvermine (J. H. Kerr)...	32	26
Wellingrove (Department of Agriculture).	30	53
Wellingrove (Finney)	30	40
Golden Glow (Department of Agriculture).	29	15
Prairie Queen (Finney) ...	29	6
Funk's Yellow Dent (A E. Cosh).	28	24
Funk's Yellow Dent (G. Ditzell)	28	5
White Mixture (W. Tonkin)...	27	38
Red Indian (W. Tonkin) ..	26	24
Early Mastodon Whitecap (Department of Agriculture).	25	15
Early Morn (Department of Agriculture).	24	38
Prosperity (W G. Murray) ...	23	50
Silvermine (A. J. Cannons) ...	23	19
Eureka (A. J. Cannons) ..	22	47
Funk's Yellow Dent (J. Ditzell)	22	44
Funk's Yellow Dent (W. White)	22	37
Iowa Silvermine (G. Campbell)	22	29
Prairie Queen (J. H. Neuss)	22	26
Yellow Hogan (R. G. Flemming)	22	2

—C. McCauley, Agricultural Instructor.

That Kitchen !

Conveniently arranged kitchens save the housewife 150 to 300 miles of walking each year, according to a recent survey, says Ruth K. Willard in Circular 63 of the Agricultural Extension Division, North Dakota Agricultural College. Consider your kitchen, she advises. Do your tracks zig-zag back and forth ? If so, can it be arranged so that you can get your supplies, place them where you will use them, cook them, and serve them with fewer steps ?

Many kitchens simply "happened," and these constitute a hard problem, as there may be built-in features, such as doors, windows, and chimneys, that cannot be readily changed, but if the whole family works on the problem many alterations can be made to save steps.

Trangie Experiment Farm.

Its Suggestions in Flock and Farm Management.

W. H. BROWN, Editor of Publications.

When, eight years ago, a stud flock of Merino sheep was established by the Department of Agriculture at Trangie Experiment Farm, it was with the expressed object of—(1) extending the facilities for educational work with sheep, (2) demonstrating the class of Merino most suitable for that part of the State, and (3) maintaining the Wanganella standard and type of Merino, with which the name of New South Wales has become associated.

The Original Objectives and their Achievement.

In the nature of things the objectives of such an enterprise tend to work out a little differently from the original intention. In the present case this has been much less marked than might have been expected. Quite a number of youths who have had pastoral careers before them have spent periods on the farm that must have been most profitable to them, but the limited accommodation available has prevented the numbers being as large as could have been desired.

The demonstration to the small graziers and farmers of the Central-western Slopes and Plains of the class of sheep most suitable for their conditions has always been in view, and no doubt silent testimony has been borne—withal the teachings of the farm might have been more earnestly heeded.

The third of the objectives—the maintenance of the Wanganella type—has been consistently pursued, and the flock to-day shows distinct progress in the fixation of the desired characters. The Wanganella has proved so eminently suitable for the conditions in a very large part of the State that the preservation of its best features is of national importance, especially in days when the fluctuations of fashion from one extreme to the other at times threaten to involve essentially valuable characters.

It was never a definite object in the establishment of this stud that the Department should enter into competition with the owners of other Merino studs, but with the object of helping the owners of small flocks to improve their sheep, rams are sold by the Department at rates purposely kept within the reach of men who cannot afford high-priced animals though desiring to improve the standard of their flocks. In this way the Trangie stud has served the smaller graziers, and through them the whole State, at a minimum outlay to those directly concerned. The number of rams reserved for sale as showing the desired type has never been large enough for the demand, and the few rams that remain on hand at the time of writing are likely to be disposed of before this article sees the light of day.

Another respect in which the stud has been useful has been the supply of breeding stock to other experiment farms, where they are required either for the strengthening of the Merinos on hand, or in connection with the crossbreeding experiments.

Developing the Dual-purpose Type.

As already indicated, the maintenance in a permanent way of the Wanganella strain of Merino was a prominent factor in the establishment of the stud. In particular it was hoped that it would be possible to develop the dual-purpose type by maintaining the medium to fairly strong wool so suitable for the Central-western Plains and at the same time perhaps developing the frame a little so that it might be more profitable for mutton and crossbreeding purposes. In the selection of the sheep from which the stud has been built up, frame and constitution were made cardinal considerations, and they have been kept steadily in view in the classing of the sheep for mating.

Type of Stud Ram in use in Trangie Farm Stud.

A large-framed, plain-bodied animal has been the objective, and that efforts in that direction have been attended with a measure of success, the sheep on the farm to-day are the best evidence. They are notable for frame development and give every evidence of physique and stamina. A slight "foldiness" on the forepart of the animals is regarded as quite consistent with the description "plain bodied," and a typical "triple apron" is to be found on many of the best in the stud.

It is not intended to produce a wool of exceptional fineness. On the contrary, the stronger and more robust class of wool of lengthy staple is aimed at, those being the qualities that naturally accompany a large frame and plain

body, and that suit the local conditions. The strength which the Sheep and Wool Expert, Mr. F. B. Hinton, keeps steadily before him in classing the sheep for stud purposes is, broadly, 60's to 64's, that being a quality that maintains its character if the sheep are sold to go farther west where the conditions may be a bit harsher, and that yet is fine enough to do well and even become a bit finer should the animals be sold to go eastward, where the conditions favour the production of a finer wool.

The Trangie stud is thus favourably situated and is carefully managed to serve the requirements of a considerable area of the State, while the sheep themselves are none the less profitable, the slightly stronger quality of their wool being amply compensated for in value by the greater weight of fleece produced. Moreover, the stud has an important relation to the development of the lamb and mutton export business. The British breeds that give the desirable mutton qualities and the essential early maturity in the lambs, can be crossed with greatest advantage upon large-framed Merino ewes. In this stud, therefore, the Department is serving the State in several highly significant ways.

The Improvements Effected.

Trangie Experiment Farm consists of approximately 9,636 acres fronting the main western railway line a mile or two west of the township. The country is flat, with alternating pine ridges and gilgais, and both black and red soils occur. When operations were commenced, 2,225 acres were reserved for the cultivation of wheat, but this area has latterly been reduced, and now 1,500 acres (half under crop each year and half under fallow) are used for the growth of wheat and oats, and for a valuable series of experiment plots. In the hands of the Department the property has been substantially improved, and the present manager, Mr. A. H. McDougall, who in 1919 succeeded Mr. A. H. E. McDonald, now Chief Inspector of Agriculture, regards its excellent condition and equipment with pride and satisfaction. When taken over by the Department, the grazing paddocks were thickly covered with dead box, buddah, yarran, and cypress pine timber, with clumps of green currant bush. Most of the big timber and of the dense scrub that grew in parts had been burnt or cleared off, but belts of pine and clumps of smaller timber had been left. In the cleaning up that has been effected in the meantime these valuable shade and shelter belts have been preserved, and all fodder trees have also been carefully saved as being useful for dry sheep, though, of course, they lack the succulence necessary for breeding sheep, and especially for ewes in lamb or in milk.

The property had previously been somewhat heavily stocked and had also carried a fair number of rabbits, with the result that the best of the grasses had been eaten out or otherwise destroyed.

The manner in which the pastures have been improved in every respect by good management is apparent to-day. During the latter part of last summer, and through the winter just past, there have been rains that have

given an attractive appearance in the present spring, with a nice covering of herbage, chiefly trefoil and crowfoot, but there are evidences that the pastures are also in good heart and of profitable carrying capacity. The crowfoot is not long lived, of course, but it leaves a considerable quantity of dry fodder on the ground when it withers under the heat of summer, while the hardier trefoil stands the summer better, and even after the leaf has been dried up and blown away the burrs keep the sheep in excellent condition, though the pastures may appear quite bare. What good country it is was exemplified in the eighteen months preceding August, 1923, during which there was little if any natural grass on the ground, yet the sheep kept fat the whole time, and with the assistance of silage two lambings were got through without appreciable loss.

Improvement has been effected in the digging out of all rabbits and thorough clearing up of all harbour. To-day if a stray rabbit intrudes he is pounced upon at once. All harbour in the way of hollow logs has been

Dipping Sheep at Trangie.
The dip is of the side-slip pattern, with a caged decoy sheep beyond the slip.

burned, though advantage to the sheep of a certain amount of fallen timber, provided it is not too large, and above all provided it is not hollow, is not lost sight of.

Another development of importance has been the subdivision of the property into paddocks of useful working size. The whole 9,600 acres is now fenced off into just over thirty paddocks. The main grazing paddocks are about 500 acres in extent, while nine smaller paddocks of 100 to 150 acres for individual mating and one ram paddock of 80 acres are provided, making it possible to join the special stud rams with selected ewes.

A valuable store of water underlies a considerable area in this part of the west at 200 to 400 feet below the surface—an asset that is highly appreciated by graziers. When the farm was acquired by the Department it was only provided with two waterholes and with one well equipped with a windmill and 10,000 gallon tank. Since then five bores have been put down; one is

equipped with a bull-dozer pump worked by a petrol-driven stationary engine, and four with windmills that lift the water into overhead tanks of capacities varying from 5,000 gallons to 16,000 gallons. From these tanks the water is reticulated in each case to serve several paddocks—in one case no fewer than ten. The equipment is so complete in this respect that the farm is able to indulge in the practice of watering the drafting yards when they are in use, to keep down the dust—an asset that adds considerably to the value of the wool.

Almost all the larger paddocks have a small set of yards for the handling of sheep as required, but there are also two full sets of drafting yards. One of these is near the homestead and attached to the shearing shed. There the equipment is very complete—five stands, fitted with machine-shearing outfits, and shelter for sufficient sheep to keep the shed going for nearly three days in the event of rain.

Jetting Sheep in a specially-constructed race at Trangie.
The liquid used is a solution of arsenite of soda.

The drafting yards in the middle of the run, which are on an even better design, are grouped round a side-delivery concrete dipping race, alongside of which is a race, one chain long and 2 feet 3 inches wide, in which the sheep are " jetted " for blowfly.

The flock is dipped annually, six weeks off shears, a standard dip being used. Of the jetting process we have something to say lower down.

Pasture Management.

The improvement of the pastures and better equipment of the farm thus outlined is not entirely that the carrying capacity may be increased Its effect is partly that plenty of feed may, as far as possible, be assured even in periods of scarcity, but partly too that by frequent changes and spelling of the paddocks, the freshness of the feed may be conserved.

The number of sheep actually on the property has always been well within its capacity. The country may be conservatively regarded as capable of carrying one sheep to two acres, but the stocking has always been light. The records show that on 30th June in each of the years 1918 to 1923 the average number of sheep on the place has been 4,300 of all ages and sexes.

The effect of this light stocking is apparent in the excellent development to be found in the sheep of all classes—more particularly, of course, among the young stock. "The ram hoggets have got to be got forward," said Mr. McDougall in a recent conversation, and then he pointed to the development exhibited by a group of young rams. He went on to remark, however, that light stocking alone would not ensure it. Fresh sweet pasture is just as important, and that is secured by the subdivision of the farm into paddocks, already referred to, which enables the sheep to be shifted frequently from paddock to paddock. The tendency of sheep when on large areas to eat out the most palatable and most nutritious grasses is well known, but this is checked and controlled by the policy adopted on the farm, which after all is not new to any experienced grazier.

When not in use for mating purposes, the small mating paddocks are kept well fed down, so that a sufficiency of feed is left in them, but no rank growth. Cattle are found to have a distinct utility in pasture management. They keep down the coarser grasses which chiefly appear in the summer after a good season, and thus improve a pasture for sheep. A small herd of "Pollies" is run on the farm—in part for their value in this regard.

The effect on the pastures of some of the improvements described above has been pronounced, and they constitute an appeal to others to do likewise as opportunity offers.

One of the problems of the west is the introduction of grasses that will stand the summer. Several varieties have been tried in the grass garden at the farm, and some are well worth the attention of graziers. Rhodes grass (*Chloris gayana*) has done well, both when grown by itself and when grown in association with lucerne. One area of fair size was sown some years ago, and has been found to stand up well when stocked, and to respond nicely when spelled. It would appear that this grass is likely to be of value in this part of the west for pasture improvement purposes.

Kikuyu grass (*Pennisetum clandestinum*), a comparatively recent introduction from Africa, grew well last spring and stood quite satisfactorily the dry hot winds that swept the grass garden.

Native millet (*Panicum decompositum*) proved the most satisfactory of several grasses tried on the place last year, passing through the summer remarkably well, and seeding heavily.

Giant Panic grass (*Panicum antidotale*) is another new but very promising introduction.

The grazier should seize any opportunity of introducing lucerne into his pastures. Four years ago when the area of cultivated land was being reduced, the Manager took the opportunity to sow 4 lb. per acre of lucerne seed on 150 acres of stubble with the object of improving the pasture. A good catch was obtained, and to-day—though it is certainly not a lucerne paddock and is never cut for hay—it makes one of the most valuable bits of grazing on the place. At times it has been grazed right down, but the lucerne has a good hold and comes again and again. Only lately, driving over the ground with Mr. McDougall just after the sheep had been removed from the paddock, it looked as though there was no lucerne at all, so closely had the sheep eaten it down as compared with the rest of the grass and herbage. It was only when a close examination was made that it could be found—but there the crowns still were, and good growth was coming away once more.

Apart from the judgment and experience that enter into the management of the pastures, the sheep do not require a great deal of extra attention. The special stud rams are supplied with a little grain during the mating period, and also at other times when it may be necessary to supplement the pastures. Although not housed, they are afforded housing shelter, which they make use of at their own volition.

A lick, composed of 100 lb. Liverpool salt and 10 lb. Epsom salt is provided in every paddock in sheltered troughs, though during periods when plenty of green feed is available the Epsom salts are omitted.

Silage and Hay.

Reference has been made to the fact that 1,500 acres on the farm are devoted to cropping. The stud sheep are never grazed on the cultivated land, which nevertheless is made to contribute materially to the security of the place for sheep. In the form of silage or of hay considerable quantities of fodder are stored every favourable season. Five pits, each capable of holding 200 tons, have been excavated, and have contained a lot of fodder from time to time. As a consequence of the long spell of dry weather that ended about August, 1923, the pits were emptied, but by the time this article appears from 400 to 600 tons of fodder will once more be stored in them, and should the year be a good one the whole of the pits may be full before they are wanted again.

On the basis of an 8-ton crop, Mr. McDougall has worked out the cost of storing greenstuff as silage at 5s. 8d. per ton. The pits cost approximately £21 each, additional, but are a permanent asset. Certainly it is not the outlay involved that should deter the average farmer or small grazier from storing fodder in this form.

The silage fed to the sheep for months in the early part of 1923 opened up in excellent condition and was readily eaten by both sheep and cattle. Ewes were successfully lambed on 2 lb. silage per day, in addition to the little dry roughage afforded by the pastures If such roughage is not available, ½ lb.

lucerne hay (best of all) or ½ lb. of wheaten or oaten hay, or 2 to 4 lb. maize might be fed to ewes, but for dry sheep the 7 lb. silage is generally sufficient. At a conservative estimate the value of the silage to the farm in 1923, when approximately 1,500 sheep were fed, would be £520. Compared with agistment country, the saving might not have been so great, but as the sheep fed were chiefly stud ewes in lamb, it was much better than sending them away from the farm.

Sunrise oats are extensively grown for the purpose of making silage, and the growth made this year goes to prove how valuable they are for the purpose. Mulga oats are also promising, and among several new varieties under trial on the farm, one or two may prove useful.

Among several varieties of wheat, Florence is the chief stand-by, evidently suiting the conditions on the farm quite well, and making good hay and silage. A series of experiments will probably indicate other useful varieties, but Florence seems likely to occupy the premier place for some time. Farmers should watch the results obtained on the experiment plots, and be guided by them as to the varieties most likely to be worth trial in the district.

Methods of Blow-fly Control.

The troubles met with on the property have been few indeed, but one of them—the blow-fly—is quite enough in itself. It has been found at Trangie that there is no royal road to the control of this pest. It has to be fought along several lines at the same time, each important in its way, and each involving a certain amount of labour.

The primary requisite is that the pastures should be kept free from carrion of any kind. The clearing out of the rabbit is of importance in this respect, for the more live rabbits there are the more dead ones, too, and therefore the more material for the flies to blow. The pastures are kept scrupulously clean of all remains of dead animals. If any sheep dies on the run the animal is skinned at once, and the carcase filled inside and treated outside with a solution of arsenic, consisting of 1½ lb. arsenite of soda to 100 gallons of water. Finally a wire-netting cover is pegged down all round the carcase for the protection of dogs. This proves one of the best controls of all, for thousands of flies are attracted to the carcase and are poisoned. It is no uncommon thing literally to find a carpet of dead flies for yards round carcases treated in this way. That the method commends itself to other graziers is proved by one owner of a large flock in the central west who in the "fly season" keeps a man employed patrolling the paddocks, treating carcases and killing old sheep and poisoning the carcases.

The fly-trap, made of a kerosene tin and fitted with a wire gauze cover, as recommended by the Department, is freely used, there being something like 100 on the farm. These also are a factor in keeping the property clean, for many flies are attracted to them in the summer.

Crutching is regularly practised, the breeding and hogget ewes being treated in the autumn. It is found best to treat ewes in lamb about four or five weeks before lambing; it could be done later, but the ewes then require extra careful handling.

Jetting is carried out as required. A special race a chain long and 2 feet 3 inches wide has been constructed in the set of yards in the centre of the run, and about 60 to 80 sheep can be placed in the race at a time. The jetting solution is made up in the proportions of 2½ lb. washing soda, 5 lb. arsenic and 100 gallons water. This is forced into the wool around the crutch of each sheep, a petrol engine being used to force the spray through a nozzle of three-sixteenths of an inch at 100-lb. pressure, which is regarded as sufficient, although the pressure required varies in relation to the amount of wool. The dressing is in this way forced well into the wool, where the poison not only kills any maggots already present, but continues to act as a poison to any that are hatched in the wool for a considerable time afterwards.

The treatment has come to be regarded as a most useful and necessary factor in fly-control, and the results are so good as to justify the recommendation of the method to other graziers.

For Small Flock-owners.

One cannot take account of this property in the way in which we have been discussing it without feeling that in important respects it makes practical suggestions to the graziers of the central west to which it would pay them to give heed. The owners of the large well-known studs may be excepted their objective also being highly improved pastures that will make for development and good wool values, but the small grazier and the wheat farmer who also runs up to 1,000 or even 2,000 sheep, might well learn from a stud like this the importance of attention to the details of flock and farm management.

Many farmers' flocks show great lack of uniformity, both in fleece and in physical characters—in some may even be seen traces of the blood of British breeds where only pure Merino is supposed to exist. These defects have a pronounced influence on the values of both fleeces and sheep, but they are not hard to remedy—or at least there is no reason why appreciable improvement should not be effected. The introduction of a few good rams from season to season will markedly influence the flock for good in a few years, and will make it an object of pleasure as well of increased profit to the owner.

It is one of the objects of the Department that on a run such as that we have been describing—not so large as to come within the class of the larger pastoral runs, and yet large enough to appeal to graziers—there should be set forth for their instruction and encouragement some of the ways in which it is possible to better their prospects. In certain directions no doubt the outlay of capital is involved, but in others what is required is only greater care and foresight—qualities that every stockowner learns increasingly to esteem, and that are well within the reach of all.

Weeds of New South Wales.

W. F. BLAKELY, Botanical Assistant, National Herbarium, Botanic Gardens.

Field Bindweed (*Convolvulus arvensis*, L.).

Convolvulaceæ—Morning Glory Family.

Botanical name.—*Convolvulus*, from *convolvo*, to entwine, in reference to their twining habit; *arvensis*, pertaining to a corn-field.

Common Names.—European Bindweed, Small Bindweed, Field Bindweed, Deersfoot Bindweed, Small-flowered Morning Glory, Cow-bind, Bell-bind.

Popular Description.—A deep-rooting perennial with smooth, slightly angular, slender stems, 1 to 3 feet long, twining about and over any plant or object within reach. Leaves usually arrow-shaped, with backward-pointing lobes at the base, on slender stalks. Flowers pink, sometimes nearly white, funnel-shaped, about an inch across, usually one or two on each slender stalk, but occasionally three or four, with a very small leaf-like bract some distance from the flowers. Capsule or seed vessel roundish, usually four-seeded. Seeds dark brown, about one-eighth of an inch long, rough, with one side flat and the other rounded.

Botanical description.—Rootstock slender, creeping underground to a great extent. Stems twining or creeping, seldom attaining above 2 feet in length. Leaves stalked, ovate-sagittate, 1½ inches long, the lobes of the base spreading and pointed, or angular. Peduncles axillary, usually two-flowered, with two small bracts at their fork, and a third on one of the pedicels, at some distance from the flower. Sepals small and broad Corolla of a delicate pink, or nearly white, an inch or rather more in diameter. Lobes of the style narrow-linear. Capsule divided into two cells by a thin partition.

Where Found.—In fields and pastures throughout Europe and central and Russian Asia, except in the extreme north. Common, and often a troublesome weed in England and Ireland, also in America, New Zealand, South Australia, Victoria, and Tasmania. In Victoria it is proclaimed noxious for the whole State.

Its Appearance in New South Wales.—It was first recorded from Parkes by Mr. J. H. Maiden, in the *Agricultural Gazette* for April, 1898, and it was said to be "the product of a packet of pansy-seed." Since then it has been received at the National Herbarium, from the following districts: —Berrigan, Cooma, Milton, Cowra, Mittagong, Ashfield, Wilberforce, and Scone.

Properties.—The whole plant is said to be bitter and purgative, and European authorities list it as a less poisonous plant than the Hedge Bindweed, *C. sepium.* The seeds, if eaten in quantity, appear to be more injurious to stock than any other part of the plant, and when ground with wheat discolour the flour and render it unwholesome if present in any quantity.

In India the roots are sometimes used as a substitute for jalap, and the green tops are utilised as fodder for goats and cattle.

Field Bindweed (*Convolvulus arvensis*, L.).

A Bad Weed for the Wheat-farmer.

Mr. J. H. Maiden, writing to the *Sydney Morning Herald* under date 18th March, 1920, referred to bindweed in the following terms:—"From appearances it can become as big a pest as nutgrass, and farmers with patches of it are recommended to leave no stone unturned to eradicate it before it takes undisputed possession. Only a careful sifting out of every piece of root, or leaving the surface soil loose and the frequent use of the hoe to remove all top growth, is likely to succeed in destroying the unwelcome visitor."

All species of bindweed are prohibited weeds under the Federal Quarantine Act, 1908-1915, and the seed is not allowed to enter the Commonwealth. Nevertheless some do find their way into the State, but the vigilance of the seed-testing staff under the supervision of the Agrostologist, Mr. J. N. Whittet, is a check upon it, and samples of imported seeds containing bindweed are condemned. Bindweed is usually found as an impurity in hemp seed, canary seed, and various species of millet seed.

As bindweed appears to be spreading in New South Wales, it is important that farmers should know something about it before it becomes a menace to their crops, and the following extracts from the Kansas State Agricultural Circular, No. 101, December, 1923, may serve as a warning, and at the same time give them some idea how to cope with it.

Bindweed (*Convolvulus arvensis*), the most destructive weed found in Kansas, is spreading over the State at an alarming rate. Heavily infested fields are practically worthless for small-grain production, because the roots sap the soil of moisture and plant food and the vines twine about the stems of the grain and prevent their proper development. The weed is so destructive and so difficult to eradicate that its presence in large areas on a farm will often reduce the sale value of the farm fully 50 per cent. In fact, there are many mortgage companies that refuse to loan money on farm land that is infested with this weed. . .

Injurious effects of Bindweed.—The reasons for considering bindweed an unusual peril to agriculture are: (1) It monopolises all the land it infests, so that crop production is rarely profitable; (2) it is continually spreading; (3) it is extremely difficult to eradicate.

Wheat is the crop most commonly grown on bindweed-infested fields, and the farmer is often satisfied with the return if there is enough clean land in the field to make a fair crop. On the actual bindweed areas, however, the yield of wheat is usually less than half the normal crop, and under droughty conditions the crop is usually a failure. Other small grains are likewise unable to compete with bindweed.

The Kansas bulletin proceeds to discuss means of controlling and eradicating bindweed, remarking that while the weed is difficult to eradicate it can be killed. Small patches can be destroyed by salting. Infested paddocks may be cleaned up by continuous cultivation, from fifteen to twenty-seven tillage operations (chiefly springtooth cultivation with 10-inch points kept down 3 inches) being given at one station where it had secured a hold. Pasturing with pigs is also useful, provided the ground is frequently worked with the plough. Smother crops such as lucerne, sorghum, or Sudan grass have been used with success in Kansas. The lucerne must be sown in the autumn after thorough and frequent working of the soil, in order that it may become established before the bindweed starts to grow in the spring. A thick seeding of close-drilled sorghum has been known, where there is abundance of moisture, to smother out almost all the bindweed in one season, but here also intense cultivation must precede sowing.

Seed Maize Contests.

CENTRAL COAST, 1923-24.

J. M. PITT, Senior Agricultural Instructor.

SEED maize contests were again well patronised during the 1923–24 season. The contests comprised the competitions for main varieties, which were run in conjunction with the Macleay and Lower Manning Agricultural Societies (each contest consisting of three plots), a competition for the Golden Superb variety (a widely-grown, early-maturing maize on the Macleay, where the Agricultural Society ran one plot), and the Hickory King state-wide contest (one plot of which was conducted on the Manning River at Wingham).

The entries for the local competitions were well up to the average, the main contests on the Macleay and Manning rivers being supported by twenty-four and thirty-one entries respectively. Fourteen entries were received for the Golden Superb contest, and seven for the Hickory King event.

A very pleasing feature throughout was the marked improvement in the samples of seed forwarded for sowing in all contests, possible exceptions being one or two rather uneven samples in the Golden Superb entries. Maize-growers are beginning to realise that good, weighty, deep grain, bright in colour, free from weevil and fungus defects, and uniform in size and shape is an important factor in a good sample of seed for sowing in these competitions.

More than half of the Macleay entries were of varieties that were practically unknown in the district prior to the 1921 competition, which shows that farmers are benefiting by this means of maize improvement. The fact is all the more remarkable when it is seen that the first ten places were filled by these newer introductions.

Quite the outstanding performance was the winning of both main competitions by the popular Fitzroy variety. To win two of the three contests on the Macleay and two of the four on the Manning is an exceptional record, and one which probably places the variety as the leading maize on the Central Coast under all conditions. The individual yield of 137¾ bushels by Messrs. Brown and O'Shea's variety at Smithtown, and the average of 108¾ bushels to the acre over the three plots, are yields far in advance of any others yet recorded in competitions on the Macleay; and when it is considered that these figures were established in an unfavourable season the performances are all the more meritorious. It may also be stated that the average yield for the twenty-four entries (110 bushels to the acre) is also a record for the river, and the average yield of 87 bushels at Euroka also exceeds the previous best by 1 bushel.

Messrs. Brown and O'Shea's Fitzroy is a rather large, very rough-dented type, rather uneven in shape and size, and showing a probable admixture of Hawkesbury Hogan. Mr. Mooney's Fitzroy is a heavy, more horny, smoother-dented, brighter-coloured grain, even in size and shape.

Very little inferior was the performance put up by Large Red Hogan in this competition, the four entries filling second, third, fourth and seventh places. It was this variety that won the first contest on the Macleay.

On the Manning, Fitzroy again won, and shares honours with Large Red Hogan, each scoring two wins in the four competitions. The average yield of 118½ bushels by Mr. Mooney's entry has only once been exceeded in competitions. The owner of the winning entry has now won two contests on the Manning and one on the Macleay—one on each river with Fitzroy variety—and much credit is due to him for the up-to-date methods he employs in growing his seed-plot.

Other notable performances were the high position held in both contests by the variety Pride of Hawkesbury and by Golden Beauty in the Manning contest. It is worthy of note that the grower of this entry (Mr. A. M. Hooke) won championship honours at the last Sydney Royal Show with the same variety, a very creditable dual performance.

Coodra Vale, a fairly early variety with no definite type, failed to live up to the performance credited to it in other districts. On the Manning it yielded much below Leaming, a variety with which it shows some admixture.

Manning Silvermine, a variety which once occupied very high positions in the Manning contests, has not yielded well during the past two contests. It is a variety requiring more careful selection. Farmers are inclined too much towards a deep, floury, very rough-dented grain, instead of selecting ears of medium dent and of more weight.

Both of the main competition plots were sown by four grains being hand-dropped 3 feet apart, in drills 4 feet apart. Measured tapes were used to ensure each entry having the same number of grains dropped throughout.

The Macleay.

The first sowing took place at Mr. D. Avery's farm in the rich maize-growing Austral Eden locality. The soil was of a loamy nature, and had previously grown a crop of field peas. These were ploughed in early in the winter, and the land was again ploughed and got into good condition for sowing on 20th September. Germination was good, and the young crop grew well. During November and December, however, a dry spell was experienced, and the crop received a setback, which, no doubt, influenced the yield. Only two entries exceeded the 100-bushel mark, both Large Red Hogan.

The second sowing took place at "Greenhills" on the Euroka flats above Kempsey. The soil here was of a sandier nature, and had previously been cropped with barley and tares. Most of this was grazed off by cows, and the

residue ploughed under. Two ploughings were given. Prior to the crop of barley and tares the land had been under pasture for five years. The land was in a rough state for sowing on 3rd October. Germination was good. During November and December the plot suffered badly from the droughty conditions, and at one period it was thought it would have to be abandoned, but the Christmas rains brought about a wonderful improvement, and from thence onward the crop grew well. No variety exceeded the 100-bushel mark here, but the yields throughout were very even, twenty-two of the twenty-four entries yielding between 80 and 97½ bushels. The best performances were put up by Large Red Hogan and Fitzroy.

Mr. D. Duncan's plot at Smithtown was a newly-ploughed piece of pasture land, in which state it had been for many years. One ploughing, three discings, and three harrowings were given, and the tilth was fairly good for sowing on 11th October. The soil was of a rich, heavy, loamy nature. Germination was good and the growth continued good throughout. It was one of the best plots seen in the neighbourhood for many years. No less than twenty-two of the twenty-four entries exceeded the 100-bushel mark, one Fitzroy and four Large Red Hogan entries exceeding 120 bushels.

MACLEAY RIVER Maize Competition.

Competitor.	Variety.	D. Avery, Austral Eden. Sown 20-9-23.	R. Steans, Euroka. Sown 3-10-23.	D. Duncan, Smithtown. Sown 11-10-23.	Average Yield per Acre.
		bus.	bus.	bus.	bus.
Brown and O'Shea, Gladstone.	Fitzroy	95¾	93	137¾	108¾
J. Booth, Timagog ...	Large Red Hogan ...	101	97¼	123¼	107¼
Department of Agriculture	Large Red Hogan ...	101¼	86½	121	103
L. Wheeldon, Austral Eden	Large Red Hogan ...	91¾	93½	122¼	102¼
Department of Agriculture	Pride of Hawkesbury	92½	80½	124¼	99
G. Levick, Manning River	Large Red Hogan ...	88	83¼	121	97½
P. Waters, East Kempsey...	Fitzroy	81½	91¾	115¾	96¼
F. Waters, East Kempsey...	Fitzroy	74	96½	118	96¼
Department of Agriculture	Fitzroy	82	87¾	107¾	92½
J. P. Mooney, Manning River.	Fitzroy	72	95½	109½	92¼
D. Dornan, Pola Creek ...	Yellow Hogan ...	74½	91	110¾	92
J. Booth, Timagog ...	Yellow Hogan ...	83¾	75½	114½	91¼
D. Avery, Austral Eden ...	Early Red Hogan ...	78	89½	103¼	90¼
H. Wheeldon, Gladstone ...	Golden Beauty ...	76¾	86½	104½	89¼
R. Lindsay, Gladstone ...	Coodra Vale ...	74¾	85¼	107½	89¼
E. Dornan, Pola Creek ...	Yellow Hogan ...	73¼	92¼	101½	89
L. Wheeldon, Austral Eden	Golden Beauty ...	75½	84½	104¼	88
A. J. Ward, Sherwood ...	Giant White ...	63½	93½	102½	86½
J. Ward, Sherwood ...	Giant White ...	67¼	81¼	109½	86
W. J. Adams, Manning River.	Manning Silvermine...	74¼	91½	92¼	86
D. Dorward, Manning River	Fitzroy	71¾	81¼	103¾	85½
R. Richardson, Manning River.	Golden Beauty ...	68¾	87	100½	85½
H. Booth, Timagog ...	Hawkesbury Hogan	78¼	69	107	84¾
J. Booth, Timagog ...	Hawkesbury Hogan	74½	81¼	92½	84¾

On the Manning.

Mr. J. P. Mooney's plot at Dumaresq Island was a rich, loamy soil, previously cropped with potatoes. The land was ploughed early in the winter and again early in September. Sowing took place on 18th September, one bag of fertiliser being sown to the acre with the dropper. Germination was good and the growth good throughout. Cutworms and other grubs thinned the crop considerably, but it was little affected by the dry spring. Nineteen entries topped the 100-bushel mark, Ulmarra Whitecap and Pride of Hawkesbury topping the list.

MANNING RIVER Maize Competition.

Competitor.	Variety.	J. P. Mooney, Dumaresque Island. Sown 18-9-23.	W. McDonald, Taree Estate. Sown 27-9-23.	W. Ryan, Oxley Island. Sown 4-10-23.	Average Yield per Acre.
		bus.	bus.	bus.	bus.
J. P. Mooney, Dumaresq Island.	Fitzroy	111	122¼	122	118½
A. M. Hooke, Taree ...	Golden Beauty ...	113¼	117½	111	114
S. Flett, Taree	Pride of Hawkesbury	117¾	107¼	112	112¼
W. McDonald, Taree Estate	Large Red Hogan ...	115	114	104¼	111
A. R. Longworth, Jones Island.	Large Red Hogan ...	114¾	117½	97¼	109¾
Department of Agriculture..	Ulmarra Whitecap ...	118¼	105¾	103½	109¼
H. E. Smart, Purfleet ...	Manning Silvermine	105½	120	93½	106¼
G. Levick, Taree Estate ...	Large Red Hogan ...	106½	112½	97¾	105½
D. McDonell, Kolodong ...	Fitzroy	104½	102¾	108	105
P. Dorward, Dumaresq Is.	Fitzroy	102¾	111½	101¼	105
W. J. Adams, Dumaresq Island.	Manning Silvermine...	106¼	107¾	99¾	104½
J. J. Adams, Dumaresq Island.	Manning Silvermine...	104¼	114¾	92½	103¾
W. McDonald, Taree Estate	Golden Beauty ...	104½	112	93¼	103¼
W. Ryan, Oxley Island ...	Fitzroy	104½	109¼	94¾	102¾
H. E. Smart, Purfleet ...	Woodside Dent ...	104¾	108	95¼	102¾
J. J. Adams, Dumaresq Island.	Fitzroy	101	97	103¼	100½
Department of Agriculture..	Yellow Hogan ...	105	104¼	90	99¾
G. Unicomb, Dumaresq Island.	Fitzroy	99	106	92½	99¼
W. Ryan, Oxley Island ...	Leaming	97¼	105¼	94	98¾
W. J. Adams, Dumaresq Island.	Fitzroy	95¼	97½	101½	98
R. Richardson, Mondrook...	Golden Beauty ...	94¼	102½	94¼	97
W. W. Cairns, Kolodong ...	Manning Silvermine...	92¾	101¾	95¼	96½
S. Flett, Taree	Golden Beauty ...	100	99½	86½	95¼
J. C. Stitt, Purfleet ...	Manning Pride ...	88¾	105½	88¾	94¼
J. Booth, Kempsey ...	Hawkesbury Hogan	112	83	78¼	91
R. McRae, Barrington ...	Manning Silvermine...	85¼	98½	81	88¼
W. McDonald, Taree Estate	Manning Silvermine...	89¼	92¾	81¾	88
R. Richardson, Mondrook	Manning White ...	86¾	87¼	87¾	87¼
S. Flett, Taree	Manning White ...	85	89¼	82¼	85½
H. W. Everingham, Nabiac	Coodra Vale ...	84¾	82½	87¼	85
J. E. Hammond, Jones Island.	Manning Silvermine...	79	89¾	77	82

At Taree Estate Mr. McDonald had prepared a good plot. The paddock had, prior to last season's maize crop, been under pasture for many years. A ploughing was given early in the winter and again before sowing. Germination was good, and growth, except for a short period during November, continued well throughout. Twenty-one entries topped the 100-bushel mark, Fitzroy and Manning Silvermine reaching 120 bushels.

At Oxley Island the soil was of a loamy nature. It was ploughed in July and again twice before sowing, and disc-cultivated and harrowed several times. The soil was in good tilth when the seed was sown on 4th October. Germination was good, but the crop was thinned by grubs. Nine entries topped the 100-bushel mark, Fitzroy yielding 122 bushels.

The Season.

On the Macleay fair average rain was recorded during the winter months and in September, but during October, November, and part of December, barely more than 2 inches were recorded, fortunately in falls ranging between 30 to 60 points, which just about kept the crops growing. After Christmas excellent rain was recorded.

On the Manning somewhat similar conditions prevailed, only less rain occurred during September and October. A heavy fall in November helped the crop considerably. However, the drought broke about Christmas-time, and good conditions prevailed afterwards.

The plots on the Manning, especially those at Dumaresq and Oxley Island, suffered far more from the depredations of cutworms and other grubs than from drought.

RAINFALL Records.

	Kempsey. Points.	*Taree.* Points.
1923—September	230	172
October	167	148
November	41	223
December	599	472
1924—January	524	743
February	219	338
March	185	113
April	500	411

Golden Superb Contest.

This competition was the second held for the variety. It is conducted chiefly to ascertain where suitable seed is obtainable of the variety, which is extensively grown on the river as an early-maturing maize. The variety is popular among dairymen, who, on account of the earliness of the variety

(about four and a half to four and three-quarter months) are able to secure a crop for grain, and then get their land ploughed again early in the year preparatory to sowing winter fodder crops. The rotation, which includes this useful variety, and which helps to keep up the wonderful fertility of the Macleay, may be recorded as follows :—

Late August and early September—Sow Golden Superb maize, which is harvested in January.

Late January, February, and early March—Sow field peas or vetches, which are fed off during July and August; land then ploughed.

Late August or September—Sow Golden Superb maize again, or, after ploughing, fallow the land for a short time and sow a main season crop, possibly Yellow Hogan, Fitzroy, or Large Red Hogan. This would be harvested in May and June, after which the land is ploughed and fallowed until time to sow Golden Superb again in late August or early September.

The value of an early-maturing variety like Golden Superb is apparent.

The plot was sown on Mr. H. Wheeldon's farm at Gladstone on 19th September, a little later than is usual. The soil was of a loamy nature, and the plot had remained untouched since the previous season's maize crop. One ploughing was given and a couple of harrowings. Germination was good, but, unfortunately, the crop ran into the dry spring, which forced the tasselling out while the growth was still short. However, the December rains partially saved the crop and moderate yields were harvested.

YIELDS in Golden Superb Contest.

	bus.	lb.		bus.	lb.
E. H. Ducat, Timagog ...	79	54	H. Kesby, Euroka	64	43
J. Skummings, Pola Creek	76	37	A. Jeffery, Euroka	63	49
W. H. McMahon, Pola Creek	75	24	J. J. Webster, Glenrock ...	63	25
Ern. Dornan, Pola Creek ...	74	7	J. Booth, Timagog	61	0
C. Kesby, Euroka	71	40	H. Wheeldon, Gladstone ...	60	30
D. Dornan, Pola Creek ...	69	14	H. Whalan, Gladstone ...	53	32
Colin Smith, Timagog ...	64	43	E. F. Reed, Gladstone ...	50	29

The grain was hand-dropped, four grains every 2 ft. 6 in. in drills 3 ft. 6 in. apart, the seed being covered with the hoe.

Very little difference was noticeable in the maturity of the strains. Nos. 2 and 3 were slightly later than the majority, although a week would cover the differences between all the varieties.

Nos. 1, 2, 3, 5, and 9 were the best samples sent along, the majority of the others showing unevenness in size and colour. Nos. 1, 2, 3 and 6 grew tall.

A sheep dip should be an adjunct to every important saleyard, not only for the use of sheep passing through the yards, but for the small holders round about the town and for travelling sheep. It can be made a profitable proposition.

Field Experiments with Peanuts.

Grafton Experiment Farm, 1923–24.

K. C. WALLACE, Experimentalist.

White Spanish, Valencia, and Chinese varieties of peanuts were again on trial at this farm last season. These plots constituted the main experiment. Plantings were also made, chiefly for seed production, of specially selected White Spanish, four South African varieties (Natal Common, Carolina Rhodesia, Spanish, and African), Virginia Bunch, Virginia Runner, and an unnamed variety from Norfolk Island.

The trials were carried out on a sandy loam of a more suitable nature than the red volcanic soil on which the crop had been grown previously. The land was ploughed with a double-furrow disc plough to a depth of 7 inches on 6th July in preparation for the crop, disc-harrowed on 11th July, cross-harrowed 10th August, springtooth-cultivated 30th August and 12th September, and lightly harrowed on 25th October. The soil was in excellent condition for sowing, which was carried out on 26th October, in drills opened up with a single-furrow mouldboard plough 3 inches deep, 2½ chains long, and 3 feet apart. The seed was sown by hand 12 inches to 14 inches apart, and covered by means of a hand plough. All the seed was shelled.

Germination was very satisfactory, but subsequent growth was slow on account of the dry weather during November. The rainfall during December, however, caused the plants to make rapid progress, and "pegging" commenced in January. Cultivations were given during the growing period to destroy weed growth and conserve moisture. The plants were hilled by means of the single-horse cultivator with mouldboard attachments on 9th January.

The rainfall for the period was as follows:—26th to 31st October, nil; November, 123 points; December, 434; January, 347; February, 284; March, 188; April, 149; total, 1,525 points.

Harvesting was carried out on 1st May, the plants being ploughed out with a single-furrow mouldboard plough and then placed around stakes erected in the field with the nuts toward the centre, an air passage being left around the stake to expedite drying. Threshing was accomplished by hitting the plants over a bar, the jar dislodging the nuts into a bag suspended underneath. This method proved far quicker than detaching the nuts by hand.

Yields and Notes on Varieties.

The trials bore out the results of the two previous trials, White Spanish again coming out top, with Chinese and Valencia following in that order. The yields respectively were 1,056 lb., 871 lb., and 678 lb. per acre. The selected seed of White Spanish yielded a better sample than that in the main trial, and at the rate of 1,172 lb. per acre.

Following are notes on the new varieties referred to above, the yields per acre being indicated in parentheses :—

Natal Common.—Similar in appearance to Chinese, with a white kernel and well filled. (Yield at Grafton, 1,084 lb. per acre).

Carolina Rhodesia.—Appears to be identical with the White Spanish already grown here. It yielded a well-filled nut with a white kernel. (Yield, 967 lb.).

Norfolk Island.—A large nut with a large white kernel, similar to the Jumbo variety grown here last season. The nuts were not very well filled, and were coarser in texture than the foregoing. (Yield, 879 lb.).

Virginia Bunch.—A large, white-kernel nut, a shade smaller than Norfolk Island, but better filled and the kernel not so coarse. (Yield, 762 lb.).

Virginia Runner.—Similar in appearance to Virginia Bunch, the main difference being in the habit of growth, as the names indicate. (Yield, 440 lb.).

African.—Similar in size and shape to Valencia, though a trifle smoother in the shell, with a well-filled red kernel. (Yield, 440 lb.).

Spanish.—A red kernel, similar to Valencia, but the nuts were a trifle rougher in shape and shell surface. (Yield, 381 lb.).

The four new varieties introduced from South Africa are worthy of further trial, the quality of the nuts yielded being very good.

THE ADAPTABLE DUTCH FARMER.

THERE is ample evidence that what chiefly set Dutch farmers to use all their wits, and to seek and value scientific and commercial instruction, was the gracious pinch of foreign competition. . . . While in the 1881–90 period the Dutch grew 86,000 hectares of wheat a year, by 1907 they had cut down to 54,000 hectares a crop which they realised was being grown in competition with areas oversea more advantageously situated. On the other hand, in response to new opportunities, mangels and beet areas have been enormously increased. A district to which a guide-book a few years old would send visitors in order to see cheese-making has devoted itself for some time to market gardening. Elsewhere fishermen as well as farmers have become nurserymen. At a recent agricultural exhibition of Dutch produce in this country a Briton was heard to complain of the perfidy of the Dutch in putting cheese on the market at a time of the year when high prices are paid, "and then at low time of the year doing something else." Just so. Three years after the Dutch agricultural commissioner in London advised Dutch farmers to produce cheddar I found one province alone marketing £40,000 in a twelvemonth.—J. W. ROBERTSON SCOTT, in the *Scottish Journal of Agriculture.*

Sheepmen, on being asked, have not hesitated to affirm that dipping properly carried out adds from 2d. to 3d. per lb. to the value of the wool. The charge for dipping is usually 1½d. or 2d. per sheep. Why should you lose this money?

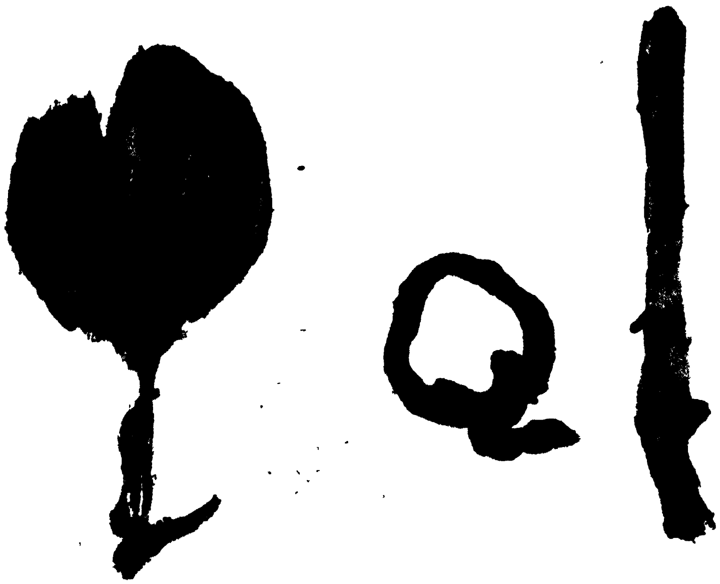
Another Fungus Attacking Cotton.

(*Sclerotinia* Sp.)

W. A. BIRMINGHAM, Assistant Biologist.

MR. H. L. WHITE, Belltrees, Scone, on 28th April, 1924, submitted to the Biological Branch cotton bolls, leaves, and stems for the determination of the cause of the failure of the bolls to ripen.

Most of the bolls were in an advanced state of decay when received. Four distinct fungi were found on individual bolls, viz., *Fusarium* sp., *Rhizopus* sp. (forming a green-brown felt-like layer on the surface), *Alternaria* sp., and Black Sclerotia (possibly that of *Sclerotinia libertiana*). Mr. White stated in his letter: "The crop from which the bolls were removed has grown most luxuriantly, but they will not ripen and open out."



a b c

Fig. 1.—*Sclerotinia* sp. attacking Cotton.

The conclusion arrived at was that the fungi present were a secondary and not the primary cause of the failure of the bolls to open, and that possibly adverse weather conditions were responsible for the trouble.

The sclerotial fungus—provisionally *Sclerotinia libertiana*—present may be described thus:—Sclerotia on the surface of the boll were black, circular to elliptical in shape, isolated or in masses (Fig. 1*a*). Only one boll showed the presence of this fungus. An extraordinary sclerotial development was found at the base of the bracts, where a definite sclerotial ring had formed (Fib. 1*b*).

The wood-fibres of the boll pedicel or stalk were exposed, the outer layers having fallen away and possibly carrying sclerotia with them. Sclerotial masses were also forming on the cotton fibres within the boll. Fig. 2 is included to illustrate apothecia (spore-bearing structures). These were developed from sclerotia obtained from dahlia bulbs.

On being placed in a moist chamber the fungus developed on the stalk on which the boll was borne (Fig. 1*c*). It first appeared as more or less globular, white, cottony clumps, later turning black, and forming hard, compact masses. An attempt will be made to develop the apothecial stage of the fungus and definitely determine if it is *Sclerotinia libertiana* Fcl.

The author has been unable to find any record of a *Sclerotinia* attacking the cotton plant.

Fig. 2.—Sclerotia and Apothecia from Dahlia x 3 times.

Control Measures.

As the fungus is carried over by means of the black bodies (sclerotia) being scattered broadcast over the ground, it will be obvious that their destruction, as far as possible, by burning affected plants, will assist materially in reducing the amount of infection.

This procedure is all the more desirable if the fungus should prove to be *Sclerotinia*, as it attacks such a large number of plants—many of them of great economic importance—such as lettuce, cucumber, carrot, beans, beet, potato, parsley, hemp, rape, and various bulbs and garden plants.

Should the soil become heavily infected, great care would have to be exercised in the choice of a crop for rotation to assist in starving out the fungus.

The sclerotia are easily detached from diseased plants. Care therefore must be taken in removing the plants for destruction to prevent these bodies from being scattered about.

I am indebted to Mr. W. J. Reay for the photographs accompanying this article.

It often happens that sheepowners are unaware that their sheep are lousy until the fact is pointed out to them by an Inspector. Examine your sheep carefully, and if you find they are infested with lice or ticks arrange to have them dipped.

The Problem of Horse *v.* Motor Transport.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.

THE proposal of an official of the city of Sydney that horse traffic should be banished from the streets of the city raises many questions of importance to the agriculturist and stock-breeder. For it may be safely assumed that once such a measure was enforced in one large city it would not be long before others would follow suit, since the proposal has certainly many attractive features, notably in the direction of cleanliness and economy in street cleaning staff.

In the United States of America this question of the horse versus the motor has been strenuously debated, and much valuable data on cost has been accumulated. Such data is not of very great value in any country outside that in which they are collected, but if in two or more countries the same conclusions are found to be independently arrived at, there will probably be some good and sound reasons for reform.

The Australian Veterinary Association has recently started an inquiry into the subject of relative costs, and the paper by Mr. J. F. McEachran, M.R.C.V.S., which follows, is one outcome of that inquiry.

It is recognised that the whole question resolves itself into one of cost. Only with a small minority will sentiment and patriotism outweigh the financial aspect. In many phases of our industrial and social life motor transport has rapidly and permanently ousted horse transport, and the number of such phases is steadily increasing. To the veterinary surgeon himself, and to the inspector of stock, a motor car has become a necessity if he is to keep pace with the rush of modern life. At the same time, there are weighty reasons for asking ourselves whether in every case in which such a transfer has occurred it has been done wisely.

The power of repeated suggestion is very great, and when the trader has continually displayed before his eyes by press and hoarding the manifold virtues of motor transport, and when his ears are continually assailed by the arguments of those desiring to sell him that same transport, it may well be that in not a few instances he has been overpersuaded and has made the change to his own and the country's economic loss.

The propaganda carried out in the interests of the motor trade is clever, persistent, and lavish. Further, although many competing firms are engaged in the work, so far as the main object of the propaganda is concerned, they act in uniformity.

On the other hand, there are no united and powerful interests engaged in the sale of horses. No one is particularly concerned in continually pointing out the advantages of horse-drawn transport—and it has certain advantages. It is only the individual owner and trader who is beginning to discover that

all the advantages do not lie with motor transport, and that in his individual case he might have done better to have adopted a conservative attitude, who is at all agitated about the question. Such individuals are rather more numerous than might be anticipated on a superficial study of the question.

Apart from these men, who are thus personally testing the question, there are other interests which perhaps do not at present fully realise the extent to which the problem of obtaining accurate information as to relative costs may affect them.

If it can be shown in any particular line of work that mechanical transport can perform that work more economically than animal transport, then it must be done by mechanical transport, and it is quite useless—and in fact unsound—to attempt to have the work carried out in any other way. But it must be shown that it is a true economy—not merely an economy that is apparent because all the factors involved have not been taken into consideration.

The farming community as a whole is interested in this question in more ways than one. Firstly the question arises, what types of farm work can be more economically carried out by mechanical power? Secondly—and this touches the farmer most particularly who relies on his returns from hay and chaff and grain as some substantial portion of his livelihood—what general forms of transport apart from the farm can be most economically effected by the horse? If it can be shown that for certain types of work the horse is most economical, then the farmer is assured of a market for his chaff, maize, and other products. If, on the other hand, the horse, whether economically or not, is more and more replaced by the motor, that market will disappear, and it is quite conceivable that it may disappear unsoundly.

The Department of Defence is urgently concerned in this question, and if it is seriously desired to put forward encouragement to landowners to breed horses of the types required for military purposes—and these are just the types that are of most value in civil life—the best way to do it is to demonstrate that there will be a future market for the horses they may breed, because it is more economical to do certain types of work with horses than mechanically.

The general public is concerned in the question, because nothing is surer than this: if an economically unsound method of transporting goods is in operation, the additional cost is being put on to the goods.

It is evident then that many interests are directly concerned in finding out the truth of this matter, and if the Australian Veterinary Association can bring out the information required, it will be doing valuable work. It can only be done through the co-operation of those who are in a position to supply details of actual experience. It is a question in which the farming community should be interested. It is not desirable that all the information and propaganda should come only from those interested in one side of the question, and therefore the attempt made by Mr. McEachran to obtain reliable and accurate information on the point is welcomed.

THE RELATIVE COST OF HORSE AND MOTOR TRANSPORT IN SYDNEY.

J. F. McEACHRAN, M.R.C.V.S.

A perusal of the annual report of the Department of Agriculture for New South Wales for 1923 will demonstrate that the number of horses in the Sydney district, and in the State, is gradually diminishing. In 1916 in Sydney there were 13,412 horses; in 1917, 12,512; in 1921, 12,489; in 1922, 11,545. In the State as a whole in 1916 there were 610,744; in 1922, 517,405.

The carriage and buggy horse and the cab horse have practically disappeared from the city streets. In the suburbs there has been a slight influx of sulky horses and ponies, due probably to the low price of such animals and the fact that suburbanites' wives like to own their own turn-out for Sundays and Saturdays.

The milk distribution by retail dairymen is all accomplished by horses. An experiment with motors is now being tried, but intelligent dairymen and other observers are pessimistic about its success either from the handling or the financial aspects. In passing, it is significant that in the home of power—America—all the milk distribution in New York is done by horse-drawn vehicles. Bread and pastry distribution is largely done by the horse, but several firms use the motor van.

The majority of retail butchers use the horse for house to house distribution, and one of the chief firms engaged in the wholesale business discarded motors some years ago and now do all their transport with the horse.

Aerated water manufacturers and brewers prefer the horse for short distance work, and some of the firms are reverting to horse transport.

In the carrying business a few have tried the power vehicle, with indifferent success, and the general opinion is that although mechanical transport is sometimes beneficial for long-distance work (*i.e.*, where roads and weather are good and repairs required negligible), it is economically bad for short-distance city work.

Those who are conversant with the running of motors will readily understand the losses entailed in repeated stopping and starting.

I have made inquiry in the city as to costs of motor power compared with the horse. In some instances careful computations are recorded; in others owners adopt the comparisons supplied by the motor firms, and the latter, of course, tend towards their own interests.

The racehorse, the trotter, and the polo pony cannot be replaced by power and sentiment and love of the animal will prevent many a man from casting aside his horses and substituting the motor.

An important factor from a national standpoint in the substitution of the horse for the motor is the fact that the money expended on the transfer mainly goes to countries outside Australia. Breeders and others should carefully consider this aspect of the question.

In many countries the horse is passing from farm life, but, nevertheless the San Francisco Agricultural Society is expending 1,250,000 dollars on a new horse pavilion, which shows that the American still admires the horse.

However, there is no gainsaying the fact that many graziers and farmers are purchasing tractors for use on their holdings. Many maintain that farm work is thus made easier and more profitable. The tractor can be adapted for all sorts of jobs—field work, water-drawing, chaff-cutting, wood-cutting, &c.—in fact it can be a complete power plant for farm use.

I have not had much experience of the value of a tractor on varying soils and relative costs of field work with the horse, but I know that it is recognised as a valuable asset by numerous owners.

If motor power is encouraged by the farmer and grazier and the horse is gradually eliminated, the question of markets and the utilisation of home-grown fodder will have to be economically considered. Such a policy may after all be suicidal.

Apart from the tractor, the question of power for road transport also appeals to the farmer. Many maintain that it materially quickens and cheapens the transport of farm produce to consumer and market. For long-distance transport of perishable produce the motor certainly out-distances the horse. Collection of milk over a large area, transport of live stock, &c., are undertaken by motor, and in some localities there is a form of communal co-operation, motor-lorries being used for carrying produce to market and bringing back household and farm supplies.

I have briefly touched on some of the uses of the motor. I shall now give details of compared costs as gleaned from owners and others :—

(*a*) Carrier who previously owned over sixty horses—now has replaced twenty with motor power. He states that a 3-ton motor lorry will replace six horses for distance work. He compares cost and maintenance as follows :—

Horse Power.	£	s	d.	Motor Power.	£	s.	d.
Two 3-horse lorries ...	240	0	0	Cost of Motor lorry, £650.			
Six sets harness	72	0	0	Cost per week motor lorry—			
Six horses	180	0	0	Wages	5	5	0
				Petrol and oil	4	0	0
Total outlay	£492	0	0	Tyres	2	0	0
Cost per week—				Depreciation, &c. ...	1	10	0
Two drivers	10	0	0				
Six horses	9	0	0		£12	15	0
Shoeing, &c.	0	18	0				
Total, per week ...	£19	18	0				

In actual practice he found that with two 3-horse lorries he earned £25 per week, and with one 3-ton lorry he earns from £30 to £36 per week.

(*b*) A wholesale meat company uses six horses for distribution purposes. These teams are used in all parts of the metropolitan area. Two horses are necessary for the large vans, and in certain hilly districts an extra horse acts as leader. The cost of maintenance, stable costs, &c., for two horses would be 15s. 1d. per week for feed, and 11s. 11d. per week for attention.

Seven years ago this company purchased two motor vans (4 tons), but they were found to be too expensive, and were sacrificed at quarter the cost. The secretary informed me that petrol consumption was excessive, running costs were very high, and garage repairs were exorbitant. His company is thoroughly satisfied with the horse, and has no intention of substituting.

(*c*) A firm of wholesale and retail bakers runs twenty-six horses and three motor vans. The trade is principally retail, and the manager states that the horse is better than the motor for short-distance delivery. To inaugurate a motor short-distance delivery system would necessitate the utilisation of men or boys with baskets, and such a method of distribution is not recommended.

The cost of running two 1-ton lorries for six months, including petrol, oil and depreciation was £112, *i.e.*, £2 3s. per week.

The cost of running each horse and cart or van was £1 10s. per week.

A good test of comparison is given on holidays, when the company cannot use the regular carters. On those days three 1-ton motors deliver 3,500 loaves in four hours. If horses were used, five carts would be required to do this work, and the time taken would be six hours. The manager states that if the trade was entirely wholesale he could distribute within the area with four 1-ton lorries.

The cost of distribution per loaf by horse is $1\frac{1}{8}$d.
Do do motor $\frac{3}{4}$d.

(*d*) A large catering establishment, with numerous branches in city and suburbs, is now running twenty motor vans, chiefly 1-ton capacity, and five single-horse vehicles. The following figures will demonstrate the cost of running a 1-ton lorry for a week of forty-eight hours, viz.,

	£	s.	d.
Petrol—10 gallons at 2s.	1	0	0
Oil	0	2	9
Running costs, repairs, &c.	0	12	6
Extra running expenses	0	10	0
	£2	5	3

The distance covered is estimated at 900 miles per month, and a set of tyres, costing £28, is allowed for each 9,000 miles. The manager stated that in this particular business a 1-ton van would replace three horses for the long distance runs, *e.g.*, Coogee, Bondi, Leichhardt, &c., but in the city proper, where the traffic is very congested and distance between shops is short, it was estimated that two 1-ton motors would be required to replace three horses.

(*e*) A carrier, with 2-ton transport lorry in use, which replaced two horses and one lorry. He conveys fruit, &c., from Parramatta to Sydney, and does carrying work in and around Parramatta. His transport can make a speed of from eighteen to twenty-one miles an hour. He estimates that on

30 miles a day he can get 8 miles to the gallon of petrol. He allows £2 per week for depreciation, insurance, &c., and 1s. 9d. per week for lubricating oil.

(*f*) A carrier replaced one horse and dray with a 1-ton motor lorry. Outlay £200. Carts wood from Kellyville to Parramatta twice weekly. Cost of petrol and oil, 10s. weekly.

(*g*) A large wholesale and retail milk company, with 480 horses stabled and fed in the city and suburbs. Motor lorries and steam-driven vans are utilised for bulk transport of milk from station to depots. Horses and carts are utilised for house-to-house delivery. The "steamer" is said to be cheaper than the motor lorry, but figures could not be obtained. The feeding of horses was computed at 16s. per horse per week. As the question of value of property in the city for stabling purposes could not be accurately considered, stabling charges could not be given.

(*h*) A firm of manufacturers, with wholesale delivery to chemists, grocers, &c., in city and suburbs. The officer-in-charge of transport gives the cost of running a 2-ton lorry for one month as follows:—Wages, £20; petrol, £12; oil, £1; garage, £3; repairs, £15; insurance £1; lighting, 14s.; total, £52 14s. If departmental and office expenses are added it will bring the amount to the vicinity of £60; 1,000 miles were covered.

According to the same firm a two-horse waggon used for similar work, but of course not covering the same ground, can be run for £29 8s. per month—wages, £17 10s.; feed, stabling, &c., £11 18s.

Of course, the matter of repairs may be serious for one month and light for another, but it is a question which is worthy of serious consideration.

(*i*) A carrier with fifty horses. The distances covered are mixed, long and short. General carrying work in city, suburbs and on wharves. The company bought a 2-ton lorry about six months ago. So far no money has been expended on tyres or repairs. The company estimates depreciation of the lorry at 33⅓ per cent., *i.e.*, in three years its life will be practically finished. In the month of March, the lorry covered 569 miles and earned £65. The petrol consumption was 74 gallons, or less than 8 miles to the gallon, and 2 gallons of lubricating oil were used.

Costs as follows:-	£	s.	d.
Petrol	7	17	3
Oil	0	12	0
Garage, sundries, depreciation, insurance, &c.	18	0	0
Wages	20	0	0
	£46	14	3

If the motor-driver is not physically fit, a second man accompanies him. If his wages are added, no profit results. The question of physique is of vital importance, particularly in connection with unloading or loading flour, bran, meals, &c. It has been stated that the horse-drivers are of better physique than the motor drivers, and thus better able for carrying work.

This firm has computed costs and earnings of a horse lorry as follows :—. Earnings : £2 5s. per day, or £11 5s. for five and a-half days. This amount is recognised as the earning capacity of a two-horse lorry. A week's expenses are as follows :—

	£	s.	d.
Wages	4	12	6
Two horses' feed	1	10	0
Shoes	0	6	0
Attention	0	3	0
Depreciation, office, insurance, taxation, repairs and other expenses—say, between 25 and 30 per cent. ...	3	5	0
	£9	16	6

This leaves a margin of profit of about £1 8s. 6d. per week.

An example of one day's work may be given. Motor lorry leaves city for Rockdale to load flour for a local shop. Driver cannot himself load, so a second man accompanies him. They load and unload 10 tons of flour in morning and 10 tons in afternoon. Distance covered, 32 miles. Day's earnings, £4 10s.

A two-horse lorry will do 10 tons in one day with one man—earnings £2 5s.

(*j*) The outfit of a firm of butchers consists of four horses, single van, and 1-ton motor lorry. Owners state that short-distance work with the motor is not profitable. Convenience of garage and the fact that stabling of horses is at Redfern, encourages the use and probable purchase of other motors. The motor lorry costs about 6d. per mile. Repairs cost £60 to £62 per year. The estimated weekly cost is £1 for repairs, £1 10s. for petrol and oil, a total of £2 10s.

The cost of feed, &c., per week, £1 8s. per horse. Owners state that for short-distance work three horses equal two motor lorries (ton).

(*k*) A grazier in Mudgee district using a tractor informed me that the cost of ploughing was 4s. per acre. He ploughed seven acres per day, two furrows. The agents for the tractor informed me that the cost was computed at 3s. 3d. per acre, but cost would depend largely on the fuel used, *i.e.*, petrol or crude oil. The grazier uses the tractor for various purposes, *e.g.*, harvesting, chaff-cutting, wood-cutting, &c. Draught horses have been sold, and crops of hay are now in reserve for bad seasons or awaiting a rise in the market.

(*l*) It is difficult to obtain exact tractor expenses when ploughing is being done. In the departmental experiments conducted at Trangie Experiment Farm in September, 1922, the costs were as follows :—

	s.	d.		s.	d.
Fordson	5	3·841	Jelbart	5	1·559
Cletrac	5	1·639	Fiat, 25 h.p. ...	9	2·375
Fiat	6	9·47	Horses and plough	4	11·911
Renault	8	7·922			

In these experiments conducted at Trangie, the feed consumption for the horses was taken at 40 lb. of chaff per head per day, at £6 a ton, with 4 lb.

of cracked maize at 7s. per bushel, and 2 lb. of oats at 3s. 4d. per bushel. The full market rate was quoted, whereas only farm quotations should have been used.

I have endeavoured to illustrate the fact that the horse is being discarded for the motor, and at times wrongly so. If figures and computations can be accepted as correct, then all short-distance work in the city should be done by the horse. No doubt the question of convenience and the cost of stabling in costly city property is one which must be reckoned with, but horse-owners should be careful about mechanicalising their plant (especially on the promissory note and hire payment system) without due and careful consideration.

To members of the veterinary profession it is a privilege to be closely associated with that noble animal the horse, and it behoves us carefully to guard his interests and wellbeing. Apart from the fact that we should do our utmost to encourage the breeding of suitable animals for the different divisions of usefulness, we should prevent any encroachment on the work of the horse by motor power, unless it can be definitely demonstrated that such a change is in the interests of the country.

Causes of Anger in Bees.

There are three things that may cause anger in bees, says the *American Bee Journal* in reply to a correspondent's query on this subject. First, the ill-disposition natural in some breeds; second, improper handling; and, third, unfavourable conditions.

Langstroth laid it down as a principle that when bees are filled with honey they are like a man who has eaten a hearty meal and little disposed to sting. Not only are they satisfied, but the filling of their honey sac causes the body to be distended and makes it inconvenient to curve their abdomen as they do when stinging. So, during a good crop, bees are likely to be good-natured; nor will the entrance guards be so irritable as when robber bees are constantly about.

Bees are frequently angered by mis-handling—by knocking the hives so as to disturb them when they are quiet—by leaving the hives open during a dearth so that robbers are encouraged—by neglecting to use a little smoke when handling—and by making quick motions when in their vicinity.

There are breeds and sometimes special colonies which are readily angered; they are usually powerful colonies, often hybrids of different races. The angry disposition of bees that have been carelessly handled may persist for quite a long time. "We have often removed the queen and replaced her with a queen of gentle breed when they appeared to have lost their gentle disposition," adds the journal.

"Would you please omit my name from the pure seed list in the *Agricultural Gazette*. I wish to thank you, and those of your Department who gave my name to different growers asking for seed potatoes; this has helped me considerably these last two seasons."—A Springside potato-grower.

Actinobacillosis in Australian Cattle.

SYDNEY DODD, D.V.Sc., F.R.C.V.S., Lecturer in Veterinary Pathology and Bacteriology, University of Sydney.*

IT now about twenty-two years (1902) since Lignieres and Spitz first recorded in Argentine cattle the existence of a disease that clinically had all the features of actinomycosis, but which differed from that disease in that the granules present in the pus from lesions did not, in addition to the familiar clubs, show Gram-positive streptothrix filaments, but, instead, a small Gram-negative bacillus. The discoverers named the organism the actinobacillus. There is, however, no doubt that this disease had been previously seen by a number of observers, but they did not recognise its true nature, thinking that the lesions were actinomycotic lesions, in which the streptothrix filaments had undergone degeneration. At the time of publication very little notice was taken of the discovery in other parts of the world except by a few observers, among whom was C. Higgins, at that time Government Veterinary Pathologist in Canada. He recorded in 1904 the existence of the actinobacillus in Canadian cattle, and described the lesions and causal organism. Two or three German investigators also wrote about the actinobacillus. In 1915 Griffiths, in England, published the results of his examination of a number of heads of cattle condemned for actinomycosis in a London slaughter-house. He found that forty of them were affected with lesions due to the actinobacillus, and only four to the actinomyces. In 1923 Bosworth recorded that he had examined thirty-six specimens, heads and tongues, of affected cattle killed at Islington, London. He does not say what the parts were condemned for by the meat inspectors; one concludes, however, that it was for actinomycosis. He found the actinobacillus in twenty-one cases, and the actinomyces in thirteen cases. The remaining two cases were undetermined.

For some years, during the course of taking my classes on meat inspection to the abattoirs near Sydney, I have noted the existence of actinobacillosis in heads of cattle that had been condemned—the condemnations were mainly for actinomycosis—but until the past few years I had not taken the pains to ascertain whether the condition was a common one in Australian cattle, or to systematically examine material from such specimens to ascertain what was the proportion of actinobacillosis and actinomycosis cases among the condemned heads, &c. During the past two years, however, while visiting the abattoirs, I have collected what material was available at the time for bacteriological examination, no special effort being made to obtain the specimens—some weeks there would be none to be had on the afternoon of my visit, while on other occasions there would be a number. I did not ascertain from what part of New South Wales the affected cattle had come.

*Paper read before the Veterinary Section, Australasian Association for the Advancement of Science, Adelaide, August, 1924.

They comprised both beef and dairy cattle, and were of all ages. The results of such intermittent investigations I propose to put before you in the present paper.

Some fifty-seven condemned heads were examined, and of these forty-two were cases of actinobacillosis and fifteen cases of actinomycosis. Of course, a far greater number of condemned heads was actually examined than the fifty-seven mentioned, but the others were seen to be definitely not actinobacillosis or actinomycosis by naked-eye examination, but cases of tuberculosis, &c., of glands. The foregoing were cases of affection of the upper or lower jaw-bones, the soft textures of the cheeks, and the submaxillary and retropharyngeal lymphatic glands. During my visits I did not see any tongues condemned for actinomycosis, and therefore I am unable to express any view as to the proportion of lingual cases of actinobacillosis and actinomycosis in New South Wales. In addition to the above, there was one case of actinobacillosis affecting the pharynx itself. The gland had been primarily affected, and apparently the condition had spread to the pharynx, penetrated the mucous membrane, and projected into the lumen of the throat as a granulomatous mass, about the size of a florin. It had a great resemblance to the case described by Bosworth in his article.

So far as I am aware, lesions due to the actinobacillus have not been recorded from any other situations than the head and throat, but we do meet with actinomycotic lesions in other situations occasionally, and I have no doubt that actinobacillosis lesions will also be found elsewhere.

From the foregoing it is evident that actinobacillosis must be considered a fairly common condition in Australian cattle, and that actinomycosis is much rarer than it is generally thought to be. There is no doubt that everywhere, not only in Australia, lesions due to the actinobacillus have been confounded with actinoymycosis.

Situation of the Lesions.

Of the forty-two cases recorded above, the jaw-bones (upper and lower) were affected in eight. Four cases were affections of the soft textures of the cheeks or intermaxillary space. In thirteen cases the submaxillary glands were affected, and in seventeen cases the retro-pharyngeal lymphatic glands. In addition to the above, there was one case of infection of the pharynx. As already remarked, no cases of infection of the tongue were seen by me during my visits to the abattoirs, but I have not the slightest doubt that some of the tongues at present condemned for actinomycosis in Australia will be found to be affected with actinobacillosis.

It will be seen that my observations go to confirm those made in England, viz., that the lymphatic glands of the head are more commonly affected with actinobacillosis than are the more dense tissues of that region.

A point of some interest concerning the two diseases is that it is usual to get only odd cases of actinomycosis in a bunch of cattle slaughtered. It is seldom that one gets a number of cases of that disease in one lot of cattle, whereas, on the other hand, I have on a number of occasions in an

afternoon found several cases of actinobacillosis from small lots of cattle; sometimes four or five cases, and on one occasion nine heads were found affected—one in the upper jaw, five in the submaxillary gland, and three in the retro-pharyngeal glands.

I wish to point out here that none of the cases referred to in this article were, so far as I am aware, condemned by the inspectors for actinobacillosis. The condemnations were either for actinomycosis or abscess in the glands.

Naked-eye Characters of the Legions.

In the case of the lesions affecting the jaws, three of them could not be distinguished from actinomycosis by mere naked-eye examination. The lower maxilla in each case was affected on one side, the bones being greatly enlarged, and showed a rarefying ostitis. The skin was ruptured in one place, and discharged a glairy, yellowish pus. Over the enlarged bones was a dense white fibrous tissue, which on section was found to contain a number of softened centres from which a yellowish, granular pus could be squeezed. In the other five cases affecting the bones of the head, viz., two upper jaw and three lower jaw, although each presented enlargement of the bones with a more or less abundant dense, white, fibrous tissue, and without incision might be mistaken for actinomycosis, the number of abscess centres was much more numerous than one usually sees in actinomycosis of that region. Some of the abscesses themselves were larger and the pus was more abundant, being yellowish in colour, odourless, and very viscid. In one case the superior maxillary sinus of the affected side of the head was completely filled with pus. In the case of the glandular lesions, submaxillary and pharyngeal, the common type of the lesion was that of a suppurative adenitis, the glands (sometimes bilaterally, but more often unilaterally) being enlarged, at times considerably so, and on section containing an abundant, yellowish-white, viscid, odourless pus. On a few occasions the adenitis was a chronic one, the two mentioned glands (more particularly the submaxillary) being enlarged and very indurated. On section, a small amount of pus could be obtained, from which on one or two occasions the actinobacillus was isolated in pure culture.

The case where the pharynx was involved is interesting. The growth projected well into the lumen of the pharynx, was of a rosy-pink colour, and had all the naked-eye appearance of a granuloma, which, of course, it was, although it might have been mistaken for a neoplasm. Behind the pharynx was a dense mass of fibrous tissue, with only one softened area in its interior, containing a little pus. The retro-pharyngeal lymphatic gland was enlarged to about the size of a man's fist, was indurated, and contained several areas of suppuration.

I may add that the diagnosis of all the above-mentioned cases was based on naked-eye, histological, and bacteriological examination.

Histology.

The histology of the lesions of actinobacillosis has already been described, and consequently I shall only refer to it briefly. Sections from the affected

soft tissues of the head, the lymphatic glands and jaws show the material to be largely composed of dense white, fibrous tissue. Throughout this, scattered at irregular intervals, are the softened areas containing colonies of the actinobacillus. Immediately surrounding a colony, if it be a young one, is a zone of leucocytes, then epitheloid or plasma cells, and, to the outside of that, fibrous tissue in various stages, from fibro-blast and spindle-cells to fully-formed fibrous tissue. In the older lesions the leucocytic zone is absent or only a few leucocytes are present. Occasionally a giant cell may be seen.

As a rule, in the club colonies, the clubs are well developed and arranged radially like the actinomyces, the centre of the colony containing masses of the actinobacillus or perhaps free from organisms. The actinobacillus does not retain the stain by Gram's method of staining, and therefore this is a valuable method of differentiating it from the streptothrix form of the actinomyces, the filaments of the latter being positive by the Gram method. Staining by carbol-fuchsin, and counter-staining by methylene blue colours the clubs red and the bacilli blue. The Kühne-Nicolle method will also give good results. Plaut's stain colours the clubs, but not the bacilli.

Cultural Characters.

If specimens of actinobacillosis are obtained fresh, it is fairly easy to obtain pure cultures of the actinobacillus from the closed abscesses; but if delay has occurred it is almost certain that contaminating organisms will be present. Often, however, there is no great difficulty in separating these from the causal organism, unlike the case of the actinomyes, where contaminations are common and are difficult to get rid of. In the more chronic lesions, however, cultures of the organisms are not so readily obtained, and sometimes failure results. Growth at incubator temperature takes place rapidly, an abundant growth usually being obtained in twenty-four hours.

On sloping agar the primary colonies are at first discrete, round, and translucent. By transmitted light they have a greenish tinge around the border, with a creamy centre. But with reflected light they appear of a yellowish-white colour. Sub-cultures show a uniform, moist, and opaque film. In stab cultures, it grows along the needle track, and there are no lateral outgrowths. I have not yet tested its action on various sugars, although Bosworth records its acid-producing powers on a number of these. It does not grow very well on solid serum. On Dorset's egg media it grows well as a creamy-looking, moist film.

I have not gone into greater detail in this paper regarding the cultural characters of the actinobacillus. They have been described by others. I have merely mentioned some of them in order to show that the actinobacillus of Australian cattle has been identified with that of America and Europe.

The vitality of the organism in artificial cultures is not very great. My experience has been that unless it is transplanted every few days the organism will be found dead when solid media is used. It will live a few days longer in liquid media kept in the ice-chest. Heat also soon kills the bacilli.

Morphology.

The actinobacillus is a short organism approaching the oval. Some forms look very much like cocci (cocco-bacillus); others are distinctly bacillary. It does not form spores. Threads are not seen, but in the lesions the bacilli are often seen clustered together in dense masses. The organism is from 1·5 to 3 m. long and about 1 m. broad.

Animals Susceptible.

Up to the present the ox is the only animal in which actinobacillosis has been found to occur naturally. I have not found it in any animals other than cattle in this country.

Experimental inoculation of large animals (cattle, sheep, and horses) has resulted in a local abscess, but the neighbouring lymphatic glands have not been affected. Guinea-pigs have been artificially infected with cultures, but the virulence of the organism for this animal has been found to be low, and large doses are required to infect.

So far as the habit of life of the actinobacillus is concerned, whether it be an obligatory or a facultative parasite, very little is known at present. Seeing, however, that it is not very resistant to adverse influences, that it does not form spores, and that it soon dies out in artificial cultures, one might conclude that in all probability it is an obligatory parasite, and in this it differs fundamentally from the actinomyces. If the actinobacillus is obligatory, then it is evident that all cases of infection by this organism arise from pre-existing ones, and that the disease does not occur sporadically, as does actinomycosis, and one would expect that where susceptible animals were congregated together, and exposed to infection, several cases of actinobacillosis would occur in one herd. This is what does occur very often, judging from the number of cases from individual mobs of cattle met with at the abattoirs, and also according to Lignieres' article, in which 50 per cent. of the cattle are mentioned as having been infected with the disease during an outbreak.

The common method by which infection is transmitted is also unknown, but, judging from the common situation of the lesions, it is probably during the mastication of contaminated food material. Possibly also the organism is conveyed in the drinking water. Contamination of these materials is relatively easy through the medium of discharging actinobacillosis lesions.

Ante-mortem Diagnosis.

On this aspect of actinobacillosis again very little can be said at present. It is very evident, however, that by no means can all of the cases of enlargement of the upper or lower jaw bones, accompanied by suppuration, be safely diagnosed as actinomycosis. Nor can abscess of the submaxillary or pharyngeal lymphatic glands. One might differentiate cases with a discharge from the lesion by examining the pus microscopically, but even here it would not be sufficient merely to demonstrate colonies in the pus or to show that clubs were present. To make the diagnosis definite it would be necessary to demonstrate the Gram-positive actinomyces streptothrix, or the

Gram-negative actinobacillus. In the case of suppurative inflammation of the submaxillary lymphatic glands, where rupture has not occurred, one might aspirate some pus, if obtainable, and examine that. In affection of the pharyngeal gland in cattle, that method is hardly practicable. It is possible that, with further work, serum diagnosis may be found applicable for the ante-mortem diagnosis of actinobacillosis, *e.g.*, compliment fixation, agglutination, or precipitation.

As to treatment, whether preventive or curative, I have nothing to say here, since I have not had the opportunity to try either, and I do not know whether any specific will be found, like iodide of potassium in the treatment of actinomycosis. If the disease is found to affect a number of the cattle on one establishment, then it is a question as to whether vaccine treatment would not be worth trying.

The Production of Good Combs.

While a fair amount of information has already been published in this connection, the subject of good combs is of so much importance and this season promises to be such an exceptionally good one for their production, that more advice, especially to the inexperienced, will not be out of place. Some time ago a beginner condemned the comb-foundation of a certain firm, stating that the bees refused to build comb from it, and just cut holes in the sheets instead. An experienced apiarist would at once have detected the trouble. The fault did not lie with the manufacturer, but with the apiarist in placing the comb-foundation on the hive at the wrong time. It must be remembered that to obtain good combs, comb-foundation, preferably full sheets, must be used, and that they must be put on the hive during a good honey flow, when the bees will build it out fully, neatly, and rapidly if the colonies are populous. Very little work will be attempted by bees in comb-building during a dearth of honey from the fields, and any foundation on the hives during such periods is likely to be partially destroyed. Bees will build out comb from foundation if they are fed artificially, but that is rather an expensive and troublesome way of producing combs. It is best to produce a surplus during a honey flow.

Many beginners, when placing a new super containing foundation on the hives, neglect to give the bees some inducement to enter it, and consequently the bees congest in the brood chamber and acquire swarming tendencies before they will get to work in the super. A comb containing honey should always be placed in the new super—a solid sealed comb if procurable.

Bee-keepers who are working a colony or two for the household honey supply often cut the comb honey out of the frame, having no means of extracting the honey and thus saving the valuable combs which the bees have expended so much energy in building. The frames are often replaced without a comb-foundation being fixed in them, and the result is that practically all drone cells are produced when the bees build the comb again. It is not uncommon to find almost as many drones as worker bees in the hives owing to the queen having access to the large proportion of drone comb. It is advisable to always use full sheets of comb-foundation. If this is not done, a queen excluder should be put under the combs which the bees have been allowed to build, so as to prevent the queen laying in the drone cells.—W. A. Goodacre, Senior Apicultural Instructor.

Rabbit Destruction.

F. W. GAVEL, Inspector of Stock, Dubbo.

IF the class of country and tenure warrants the expenditure, there is only one way to deal with the rabbit problem, and that, in short, is total extermination. This can only be achieved by the destruction of permanent harbour, including warrens, and the sooner we recognise there is not any easy road to the destruction of the pest the better it will be for all localities and districts in which they have become established.

Time after time some new method has been discovered which promises to give the desired relief, only to be discarded after too much reliance has been placed in it, and much valuable time wasted.

There is no animal at large with the faculty of self-preservation more pronounced. There certainly is not any animal with more natural enemies, and without cover it is impossible for it to protect itself. If cover is taken from it, it disappears like chaff before the wind. It is a prey to hunting animals and birds both by day and by night, but given a little cover and respite it soon entrenches itself and becomes a menace not only to the spot it infests but to surrounding country.

There is no truer axiom than the one "Aim at the rabbit and you miss him; aim at his cover and you hit him." Put the rabbit on the surface without harbour and the problem is solved.

There is not the slightest doubt that if rabbits could be exterminated for half the capital value—or in some cases the full capital value of grazing land—it would be a profitable project. There is not any improvement that will give such a substantial return as the destruction of rabbits. Fortunately, there is not, as a general rule, the necessity to incur the heavy expenditure above stated; in many cases 4s. or 5s. per acre, and in some cases less, is all that is needed. And those that have spent years with the poison cart, fumigator, and other methods, wonder when they undertake the problem in the correct manner, why the scales were so long in falling from their eyes.

Destruction of Harbour.

When this method was first adopted a good deal of unnecessary work was done in burning all logs and fallen timber, and in some cases standing dead trees, and in digging out all warrens, no matter at what depth. It has now been found that if hollow logs and hollow trees are destroyed and warrens are ploughed or dug to a reasonable depth that is all that is necessary, excepting that if warrens are not dug to the full depth they must be carefully watched and any openings found must be followed and fumigated, or "trapped" and destroyed. In fact, all country treated must be carefully hunted until the last rabbit is caught. This is a most necessary auxiliary to the process. The ordinary spring trap will be found very useful in catching the last rabbit.

Ploughing out is found to be the quickest and least expensive method. Various kinds of ploughs are made for the purpose. In some cases they are drawn by horses and some favour bullocks, but it may not be generally known that a plough with a large disc made for the purpose and drawn by horses is just as effective and much quicker.

Unfortunately, rabbits have entrenched themselves in hilly, rocky country that is difficult to treat, but if the flats and hillsides are treated where possible, and the hiding places in the rocks are broken up as much as possible and plugged (provided the work is not too costly) much benefit will result.

Rabbit-proof Fences.

Rabbit-proof fences have proved one of the great factors in rabbit suppression. Not only have they served to keep holdings free or nearly free, but the many miles erected and sections enclosed have mainly stopped the periodical waves so much dreaded in the earlier history of rabbits, and a timely rabbit-proof fence, acting as a barrier, has accounted for millions when a wave was in progress.

A good deal might be said about the erection of rabbit-proof fences, but it is generally known that the best results are obtained by the use of wire-netting 42 inches wide, 1¼-inch mesh, and 17 gauge, placed 6 inches in the ground and 3 feet out. The old-fashioned 9 feet or 10 feet panel fence is not often erected now; it takes too much timber, is harder to protect, and is a great sufferer in time of fire. Longer panels with heavier posts, interspaced with droppers and protected by barbed wire, make a more durable and serviceable fence.

A roadway should be cleared on either side, and all overhanging limbs and trees should be removed. All warrens adjacent or under the fence should be destroyed. Care should be taken not to leave any logs, stumps, undergrowth, or anything that might be used as a stile to help the rabbit over. It should be remembered that the rabbit is a most constant and industrious examiner of the fence, and readily avails itself of any opportunity to get over, under, or through it.

Poisoning.

Poisoning is perhaps the next best known method of rabbit destruction. It has passed through many phases, from the days when phosphorised wheat and oats were used, to the discovery of phosphorised pollard, which was thought to be the solution of the problem, and then on to the various patent poisons. But still the rabbit survives the lot.

It is probable the poisoned bait will be used for many years to come, whether pollard, jam, thistle root, or some other material. It is the best known method of keeping the rabbit in check where extermination is not warranted, or cannot be carried out.

Poisoned water has been used in dry areas. It is a most drastic means, because it poisons not only rabbits, but anything else gaining access.

Fumigating.

This is a most alluring method and must be used with caution. There is no method that gives greater promise, and that in the end proves a more dismal failure. Instances could be quoted where by fumigation hundreds of rabbits were destroyed in a single warren, and yet within a short period the warren was well tenanted again. No fumigation, no matter how thorough, can account for every rabbit over any given moderate-sized area. All the rabbits in odd warrens, or in the majority of them, may be destroyed, but there is always the percentage where the gas fails to be entirely fatal, and in these and the rabbits which manage to hide outside, lies the danger. They soon reinfest the warrens, dig deeper, and learn to protect themselves against the next fumigation. Therefore if it is at all possible, destroy warrens and harbour.

It has been advocated by some that we should fumigate and then destroy warrens to a given depth. That is "putting the cart before the horse." It is better to destroy the warrens to a depth of about 20 inches, and should any openings occur they may be fumigated and watched. Fumigating warrens lowered to a depth of 18 or 20 inches below the surface is quite a different matter to fumigating warrens with shallow openings and vent holes on the surface which cannot be detected. Fumigation alone will never destroy warrens, and where the warren is, that is where the rabbit will be found.

Trapping.

Trapping for commercial purposes and poisoning for skins may give temporary relief, especially if skins are dear, but that is the most that can be expected of it. It will never exterminate the pest, and it scatters and leaves sufficient to become a serious menace, and the probability of an invasion in seasons favourable to the increase of the pest. The ordinary spring-trap will be found most useful in catching the last few rabbits after harbour has been destroyed.

Concluding Notes.

It is not the intention to give the methods of preparing the different poisons here. They are well known, or if not, can be easily obtained. Nor is it the intention to give the best brand of fumigator and the material used. A much greater service would be rendered by the encouragement of destruction of warrens and harbour.

There is not any pest that has cost the pastoral industry of New South Wales so much money, and none has done so much to retard the progress of our wonderful wool industry, but fortunately there are large areas free now which a few years ago were alive with the pest. It is unthinkable that they will ever be allowed to re-establish themselves. The lesson was too dearly bought, because it was only undertaken when so many other methods proved failures. The areas or localities that are rabbit-free now are standing object lessons and an encouragement to others to go on and do likewise.

Spur Pruning of Pear Trees.

"Rather startling results have been secured from a new method of pruning the Anjou pear, by Rev. H. I. Bittner, of Nob Hill, Yakima Valley," comments a recent issue of the American journal, *Better Fruit*. Having come into possession of twenty-two 10-year-old Anjou pear trees which were not giving much of an account of themselves, and having failed to secure information which seemed to him likely to help him in their treatment, Mr. Bittner decided to try some methods of his own. Taking three trees, he pruned them each in a different manner. In the case of the first, he headed back all the main branches about 3 feet, the second was deprived of some of its scaffold limbs and given a general light pruning, while in the third tree he left all the scaffold limbs, but trimmed off 50 per cent. of the fruit buds in the clusters. In applying the last-mentioned method he argued that the Anjou blooms too heavily, which interferes in some way with the setting of the fruit.

The tree which was headed back yielded four and a half boxes of pears; the tree from which a number of scaffold limbs had been removed yielded seven and a half boxes, and the tree on which spur pruning had been practised yielded sixteen and a half boxes. This was in 1921. On the strength of these results, the following winter he pruned all his trees by the spur method, and obtained in 1922, 4 tons of pears from the thirty-two trees.

The foregoing is of interest in that the method of pruning described is similar to the spur pruning carried out on Winter Nelis pears in New South Wales. This variety was found to be a very shy cropper, but experiments carried out some years ago by Mr. G. A. Meier, Orchardist at Bathurst Experiment Farm, proved that by heavily thinning out the fruit spurs the trees could be induced to set a heavy crop of fruit. Heading back of the main leaders or thinning out of the main limbs was carried out according to the requirements of the framework of the tree, independent of the thinning of the spurs. Good results from thinning of the spurs of the Winter Nelis have been obtained in many of the pear districts of New South Wales.

Return of Infectious Diseases Reported in September.

The following is the return of outbreaks of the more important infectious diseases reported during the month of September, 1924:—

Anthrax	Nil
Contagious pneumonia of swine	,,
Pleuro-pneumonia contagiosa	,,
Piroplasmosis (tick fever)	,,
Swine fever	,,

—Max Henry, Chief Veterinary Surgeon.

Thanks for Returned *Gazettes*.

The appeal in the September issue for spare copies of certain back numbers of the *Gazette* of which the Department was in short supply was answered by a number of readers. In some cases no mention was made of the sender's name, making personal acknowledgment impossible. To all who found it possible to be of assistance in this matter the Department now extends its thanks.

Passion-fruit Culture on the Tweed.

H. W. EASTWOOD, Orchardist, Wollongbar Experiment Farm.

ALTHOUGH the cultivation of passion-fruit is at present a negligible quantity on the Tweed River, the district has certain advantages over those farther south. Not only are the vines more vigorous and the crops about half as heavy again, but there is the important factor of earliness.

Whereas in the counties of Cumberland and Northumberland two crops a year are produced, in the Tweed River district the passion vine produces only one main crop, known as "the summer crop." The vine begins to blossom about the middle of August, marketing commencing at the end of October (about four to six weeks ahead of the main southern crop), and continuing throughout November and December and occasionally into January. The "off" crops (which include all fruitings outside the four months mentioned) are ripening practically throughout the year, but they are borne in such small quantities (on the existing scale of production) that it hardly pays to handle them. The earliness of the main crop is the salvation of passion-fruit growing in this district, and it is not considered that it would pay to interfere with this crop by pruning, &c., with the object of obtaining off crops later in the season, as such off crops would probably come in with the main crops from the southern districts. The main crop is, therefore, allowed to grow naturally, though it may be advisable to remove the wood that bears blossoms which do not mature by the end of December.

If the vines are planted about September they will bear a light to medium crop in fifteen months' time, and will continue to bear light off crops during that season, but it is usually the following summer—that is, two years from planting—before a profitable crop is obtained. Three seasons of profitable crops may be reckoned on as a rule, making the average profitable life of the vine five years. Under the best conditions it may last a year or so longer, but the crops are usually lighter.

It is recognised that Sydney presents the only market at present for passion-fruit from the Tweed, and the Sydney market is only available after the winter crop in the counties of Cumberland and Northumberland is over and before the summer crop comes in. It is a good market from the end of October until the end of December, but as soon as the southern crop and summer fruits appear (about the end of December) it "slumps" as far as this district is concerned. However, as the main crop comes in from the end of October until January the major portion can be marketed in Sydney at satisfactory prices. After the end of December the prices that are ruling do not cover the cost of picking, packing, and forwarding.

Authentic data as to the financial aspect of passion-fruit growing in this district are difficult to obtain, but certain estimates may be made. Land ready for the plough can be secured for about £45 per acre. The cost of

establishing an acre of passion-fruit and maintaining it until profitable returns are secured is in the vicinity of £40. Assuming four annual crops to be the profitable life of the vine, a sinking fund of £10 per annum would be required to recover the £40 expended in establishing an acre. Interest at the rate of 6 per cent. per annum on the price of the land would be £2 14s., making a total of £12 14s. to be recovered before any profit can be expected. In addition to this, the seasonal expenses for cultivating, pruning (if practised), picking, packing &c., would have to be considered. Reckoning the average yield at 200 bushel-cases per acre, and allowing for half of the crop being unmarketable, there remain 100 bushel-cases, which, at an average (and conservative) price of 15s. per bushel-case, gives a return of £75 per acre. The cost of marketing, including the case, is 6s. a bushel from Murwillumbah; that is, £30 for marketing the crop, which leaves £45 profit from the returns. The amount of £12 14s. has still to be subtracted from the return of £45, which leaves a net profit of £32 6s.

Pulping, which is destined to play an important part in the passion-fruit industry generally, would form a useful means of dealing with fruit from this district that could not be sold on the ordinary market advantageously.

The Advantages of Diversified Farming.

Farm cost figures gathered from North Dakota farms for the past five years seem to indicate beyond any doubt that a well-balanced system of agriculture pays best in the long run. The one-crop farmer may possibly make a big stake one year, and even for several years, but he is bound to fall when hard times strike him. Farming at best is pretty much of a gamble, and one-crop farming is the most extreme type of gambling that a farmer can indulge in. Making good as a farmer is a job of a lifetime, and it is the average net income over a period of fifteen to twenty years which determines a man's success or failure. For this reason it seems desirable to eliminate as much of the risk as possible. The farm having several sources of income is not entirely dependent upon any one of these, and a total failure on a farm of this kind is practically impossible. Livestock products bring an income every month which can be used to pay grocery bills and other current expenses. The farmer who raises a large percentage of his own food has always got something to live on, even if times may be rather hard.

It seems, therefore, that the system of farming which pays the best, and the system which insures the greatest degree of safety, is a well-balanced system providing for a definite rotation of crops, and providing, also, for the raising of livestock. Farm cost figures seem to indicate that the diversified farmer with considerable investment in livestock is usually the farmer who weathers hard times best in any community. The one-crop farmer or the man who depends almost entirely upon crops to the exclusion of livestock is generally the man who goes bankrupt first of all when hard times hit the community.—T. S. Thorfinnson, in Circular 61, Agricultural Extension Division, North Dakota Agricultural College.

Co-operative Marketing of Fruit.

H. BROADFOOT, Senior Fruit Instructor.

In considering this important subject—a subject fraught with great possibilities—it is useless to attempt to conceal the fact that difficulties exist, but, on the other hand, determined, consistent, and wisely-directed effort can overcome the difficulties and achieve success.

Among the difficulties to be overcome, not the least is the conservatism and apathy of some of the growers. In every district there are some who prefer the beaten path. They distrust new ventures. On the other hand, if some growers do co-operate, the advantages they obtain so soon become apparent that even the most diffident and conservative are glad to throw in their lot. This has happened at Gosford. The advantages of co-operative marketing have been so striking there that every year sees additional fruit-growers becoming shareholders, and new co-operative centres, inspired by the success of the initial venture, have been formed. After all, conservative, timorous growers are not in the majority. Contact with the soil seems to impart independence of character and courage to tackle new problems.

There are other difficulties, however, which may be briefly referred to. There are the difficulties of scattered settlement, of poor roads, of inadequate means of transport, of labour, of poor knowledge of orcharding, of orchards planted on unsuitable land and planted with unsuitable varieties.

If better roads were provided, then difficulties respecting means of transport would be overcome, for in these days of motor traffic the problem of transport, even in scattered districts, is easily solved.

Finding and keeping suitable labour is always a difficulty, but co-operation does not increase it. It may or may not lessen it, but at the worst it leaves it as it was before, while at the best it finds some more or less satisfactory solution. It is probable that, since demand is usually met by supply, a special kind of worker, trained to special work, may be called into being by the demands of co-operative activities.

Organisation through Co-operation.

In co-operation, growers can do much in the way of successful organisation which is impossible to growers as individuals. In each important fruit-growing centre a packing-shed could be erected with (where possible and desirable) a cool store as an adjunct. These would make for economy of time and produce. The successful working of the concern would depend upon the suitability and quality of the fruit grown, on care in picking, carting, handling, and packing, on the character and business capacity of the manager, on advertising and economical distribution.

Some growers do not pay enough attention to, nor exercise sufficient judgment in, the picking of fruit, especially when the yield is large. The

fruit is picked right out at once, and consequently large, small, mature, and immature fruit is mixed up. The trees should be gone over several times, and the largest and mature fruit picked first, so that the remaining fruit has a chance to develop. This would give a far better average crop, both in size and quality, and would result in the packing of better fruit, with better returns to the grower.

Carelessness in picking is sometimes in evidence. Fruit is often picked without stalks, and dropped carelessly into picking bags and cases. Sometimes cases are filled too high, often cases are made with very rough timber and with wide spaces between the boards on top and bottom, and often, again, the fruit is carelessly carted over rough roads.

Some growers, failing to gauge the magnitude of the crop, do not realise until picking and packing are in full swing that they have not secured sufficient packing cases. Delay in securing a further supply frequently ensues, and this means that the grower's pack contains a percentage of windfalls and over-matured fruit. Such fruit depresses the market and gets the grower a bad name. It may even reflect upon a whole district, and upon some particular variety or varieties of fruit.

A competent manager of a co-operative packing shed would soon anticipate his district's needs and provide cases accordingly, and a manager with backbone would refuse to forward, under the brand of the company, any fruit that would be likely to disappoint buyers and create a feeling of distrust.

Growers are frequently wrong, too, in their estimate of the number of hands required during the picking and packing season, and very often they have to take anything that offers, no matter how unsuitable and inexperienced. Many men that offer never have picked—and many of them never should pick! They fail to recognise that fruit must not be bruised—that it must be handled carefully. It is one of the essentials of success that fruit must be picked and conveyed to the packing-shed unimpaired in quality. In co-operative centres it may be possible to organise a picking gang—alert, careful, responsible, with a skill that comes of specialisation—to act under the direction and control of the packing shed manager.

Each man could be given tickets with distinguishing numbers, and would place one of these in each of his cases, so that faulty picking and faulty handling could be traced to the right source.

Importance of a Capable Manager.

It would be of prime importance to secure as manager a qualified, strong, alert, and trustworthy business man, able to handle men, a good organiser, able to instruct—always on the lookout for opportunities to find new and profitable outlets, and always eager to conserve the interests of growers as a whole. He may even be able to embark profitably upon the preparation and sale of fruit in other than the fresh state, but his whole time should be devoted to attending to the duties of supervising the grading, packing, and marketing. Get the right man, and having got him—trust him. See that he is not exposed to vexatious interference, and support him when he takes a stand in the interests of the growers generally. Account-keeping should be

given over to a bookkeeper, whose books should be audited by a competent and independent accountant.

A co-operative packing shed—the dimensions of which would depend upon the number of cases actually and (within limits) prospectively to be handled—would be necessary. It should be equipped with packing benches, conveyers, sizers, &c. A few skilled quality-graders and packers, being engaged exclusively at their work, become very expert, and would quickly pack enormous quantities of fruit. These, with the case-makers and nailers, would reach a very much higher state of efficiency than could be reached by the individual grower, who has to turn his hand to anything.

A co-operative company can affix to its cases labels stating the variety, grade, and number or size of fruit in each case. Such a label would be accepted by the buyer as a sort of guarantee of much greater value than a similar guarantee by the individual grower. No prudent manager, no business company, could ever think, as some individuals foolishly appear to think, that anything is to be gained by supplying fruit not true to label. It would undoubtedly be to the advantage of a co-operative company to maintain a high standard of marketed fruit. Honesty is, after all, the best policy.

To Secure Public Confidence.

It is essential in the interests of the growers that public confidence be secured, and it is essential to the growers' interests that it be maintained by honest dealing. A consumer who orders fruit from the grower or his agent and finds it not up to reasonable expectations—badly packed, badly graded, ill-conditioned—will not only refuse to run the risk of loss and disappointment by ordering again, but will make known his disappointment to his friends, and will become a most undesirable "publicity agent." A co-operative company has less temptation to market unsatisfactory fruit than has the individual grower. In such a company the good sense of the majority of shareholders could be depended upon to uphold a manager who stood firmly against one or two foolish and disgruntled growers for a good standard of fruit, true to label, honestly and attractively packed.

Co-operative companies, either singly or in association, could embark upon a widespread and well-organised publicity campaign. This campaign might be conducted by advertisement in the press, on hoardings, or picture show screens, and by medium of public schools. If approached, the Department of Education would probably publish in its *School Magazine* articles showing the dietetic value of fruit, and how much more it is conducive to health than much of the stuff children buy with their pocket-money.

It is not too sanguine to hope that fresh fruits and their juices would take the place of the artificial preparations imbibed by thousands of our citizens daily. Medical science is discovering the value of vitamines—well, fruit is one of the best sources of vitamines.

Powerful appeals could be made to the eye by means of show-cards with attractive and well-executed pictures of fruit artistically coloured, and the cards (eye-letted and corded) could be distributed to be hung on school

walls and similar places. It would not be difficult to obtain from medical men, dentists, and dietetic authorities brief and striking testimonies to the value of fruit-eating for the maintenance of bodily functions. These could be broadcasted. Wireless might even be enlisted to help in the propaganda. Such a campaign would need to be widespread, persistent, authoritative, forceful, terse.

Methods of Distribution.

The distribution of fruit is of great importance, and there is plenty of room for improvement upon present methods. Agents have been selling fruit for a long time, and have evidently met a need, and they are at present indispensable. Any move to eliminate them at once would be futile, and would necessarily fail. If effective changes are brought about, it must be upon the producers' initiative, and it must be gradual. Evolution—not revolution—must be our watchword.

A step forward would be the opening, by co-operative companies, of wholesale fruit depots, and later the opening of retail shops. For one man who will buy a case of fruit at a time, there are probably hundreds who buy by the dozen. Distributing centres might be arranged in various suitable towns in the State, where the consumer could buy in either large or small quantities. There would then be a chance of the return to the growers of some of the great difference that exists between what the consumer pays and what the grower receives.

The distributing centres should not be confined to the metropolis, although there, of course, a beginning would be made. Many country towns, especially those in non-fruit-producing districts, afford good prospects of profitable trade. Fruit trains might be run carrying fruit to depots in charge of appointed salesmen, and there might be regular delivery carts and other means of distribution. Faster railway service, and refrigerating cars would help. The great thing is to reach the consumer as directly as possible, to treat him honestly, and to gain and keep his confidence.

We have "Country Week," "Australian Manufacturers' Week," and so forth. Why not a "Fruit Week," devoted to urging the dietary value of fruit and advocating the larger use of this excellent food? Such a fixture was conducted in Victoria some time ago, and proved a pronounced success, greatly interesting the public in the subject. Only a commercial organisation can undertake such a propaganda to advantage, and the co-operative company, or association of such companies, would be the most effective of all in that relation.

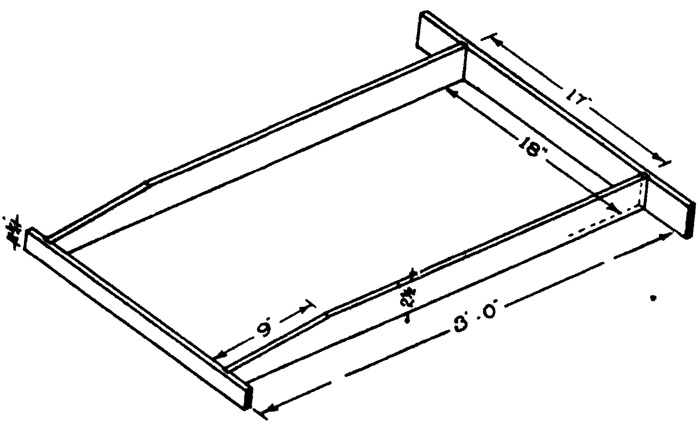
ELIMINATION OF *Nosema apis* BY SELECTIVE BREEDING.

A CONSIDERABLE amount of time has been devoted to the elimination of *Nosema apis* during the past year, with very satisfactory results. A close watch was kept on all colonies, and it was observed that several were particularly resistant to this complaint. By breeding from these colonies and introducing the queens of that strain to affected colonies in the apiary a very marked improvement has been obtained.—E. A. SOUTHEE, Principal, Hawkesbury Agricultural College.

Concrete Hive Stands for a Permanent Apiary.

H. GRAHAM SMITH, Apiarist, Hawkesbury Agricultural College.

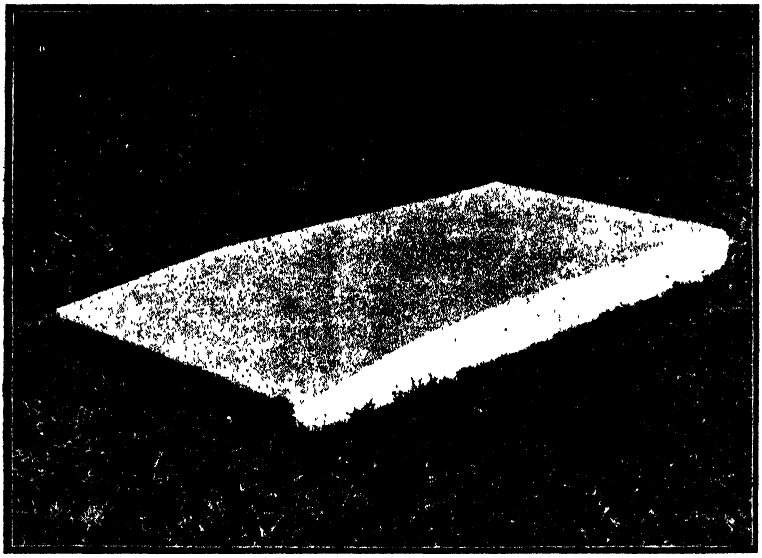
THERE is scarcely any limit to the variety of articles used by bee-keepers as stands for hives. The idea seems to be that anything that will keep the hives from direct contact with the ground is good enough; thus we find brick-bats, inverted beer bottles, stones, disused benzine tins and the like brought into use to serve this purpose. The users fail to consider the possible damage that they are doing to their colonies or the loss they may be sustaining, which would often pay in a very short period for a hive stand that would last for all time.



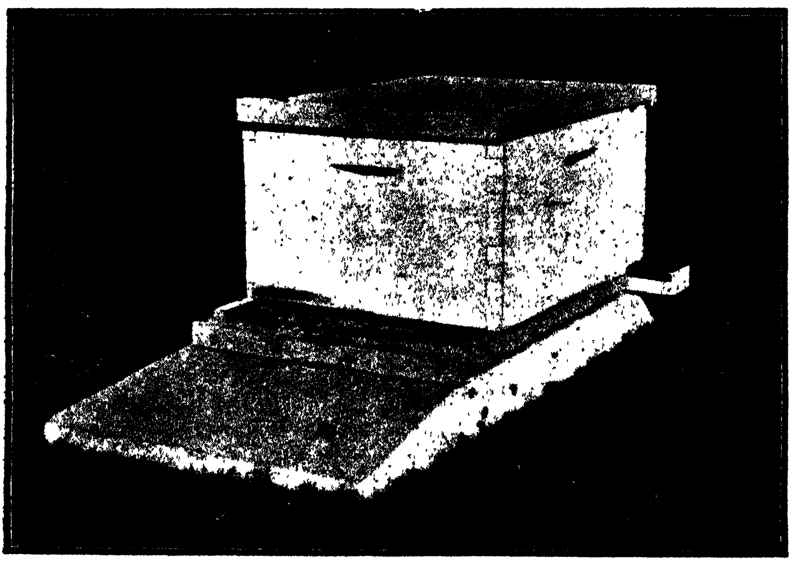
Mould for making Concrete Hive Stands.

An ideal hive stand should be durable. It should not provide a harbour for bee vermin. In length it should extend far enough beyond the entrance when in position to provide a suitable runway for heavily-laden bees returning from the field, and at the same time prevent the growth of vegetation at the entrance of the hive. It should also be inexpensive. Concrete hive stands have all these advantages. They are proof against weather conditions (except that they improve with age), and will give service for generations. Unlike wooden hive stands, they are not liable to invasion by white ants, they do not crack or warp, nor do they require to be painted. When placed in position they remain plumb even when the hives become heavy with honey. Slightly let into the ground, they rest firmly, and as they are solid there are no interstices for harbouring vermin. Miscellaneous types of hive stands sink in the ground, particularly in wet weather, causing the hives to become out of plumb and giving the apiary a disorderly

neglected appearance, which may often be taken as an index of the conditions existing within the hives. An additional advantage that concrete hive stands have over others is that Alexander feeders can be fitted to them in a minute and removed as quickly.

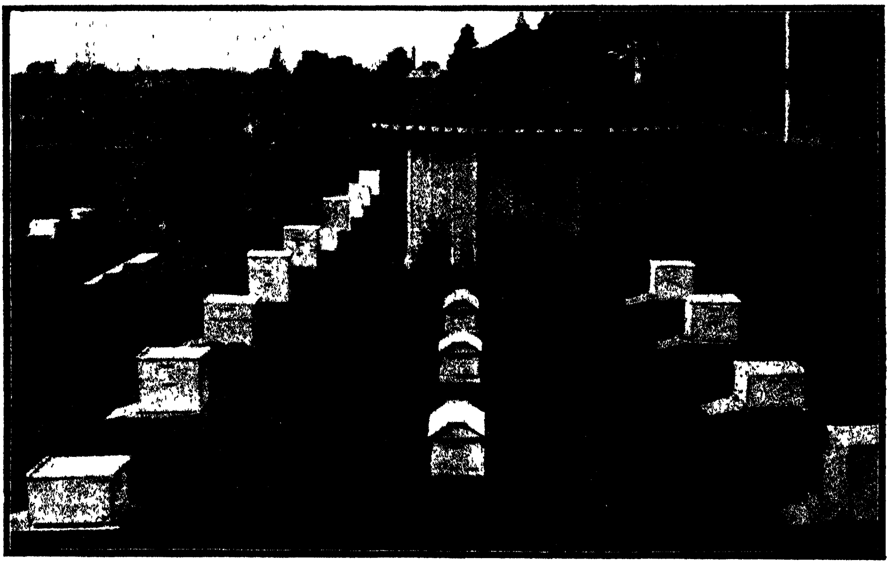


Concrete Hive Stand in Position.



Ten-frame Langstroth Hive on a Concrete Stand.
Alexander Feeder fitted at rear.

The superficial area covered by a ten-frame Langstroth hive body is 336 inches, and that of the hive stand 630 inches. The stand is therefore nearly double the size of the hive body; it provides the bees with a gently-sloping landing at the front, and keeps the latter free of grass and weeds, growth of which about the entrance impedes the flight of the bees and prevents proper ventilation in hot weather. Concrete stands are not claimed to be a recent innovation; they have now been in use at the College apiary for over fifteen years, and have given perfect satisfaction in every respect. It was originally intended that they should form a combined hive stand and bottom board, but experience has shown that better results are obtained



Portion of Hawkesbury Agricultural College Apiary. The Hives as they stand after Fifteen years.

when bottom boards are used with them. It was necessary, when using them in combination, to nail a three-eighth strip of wood below the back and sides of the brood chamber to provide an entrance and bee space below the frames. Brood chambers and supers were then rendered uninterchangeable, which proved a serious impediment in modern methods of hive management.

A number of hive stands of the concrete type have recently been made at the College. The model has been improved and the proportion of materials altered with the object of reducing cost of production. Eight stands of the dimensions given in the diagram can be made from one bag of cement costing 7s.

In modelling these stands we selected, first, a firm, level site, upon which the moulds were placed; in this case the stands were later to be conveyed to their permanent location at an out apiary. The concrete was prepared in the proportion of 7 parts coal ashes, 2 parts sand, and 1 part cement.

A layer of concrete 1 inch deep was poured into each mould and slightly rammed, and small rods of scrap-iron or pieces of stout fencing wire inlaid for reinforcement. The moulds were then filled to the top, carefully rammed down and the surface worked with a trowel to make it even. Finally, they were covered with a wet bag and allowed to set for twenty-four hours, when a thin coating of 2 parts clean sand and 1 part cement was used in facing them off. This coating is applied with a trowel, and if the work is carefully done a smooth finish is obtained.

If preferred, hive stands can be made on their permanent locations by first levelling the ground and ramming the earth well inside the mould, but to secure uniformity it is recommended that they be made on a well-trodden site and transferred to their positions afterwards. Made to this pattern, concrete hive stands are neat, effective, and (being practically everlasting) economical.

Honey as a Stimulant.

Honey-sweet is a combination of glucose and levulose in nearly equal parts, two of the several different kinds of vegetable sugars existing in nature.

Levulose is a fruit-sugar that has real medicinal value, being readily tolerated in diabetic tendencies, or even decidedly beneficial. It is the only form of sugar that can be assimilated into the blood without any preparation. All other sugars must be converted by digestive processes before they are used by the human system.

Honey, then, is the only sugar supplied by nature in a form ready for instant use. It is a quick and lasting stimulant in cases of exhaustion and nervous collapse, as well as extreme fatigue. A teaspoonful of honey in half a glass of water, either hot or cold, will restore exhausted energy wonderfully, with only beneficial reaction. No "dull gray dawn of the morning after" follows the use of honey, either as stimulant or food —*Better Fruit.*

Psychology in Dairying.

Dairy cows form very strong habits, and if the dairyman makes use of this trait much of the routine work becomes simplified and easier. Regularity in systematic operations is essential. Irregularities worry cows and undoubtedly affect the milk-yield—milk production is largely a matter of nervous force. Ordinarily cows are milked twice a day at regular intervals, morning and evening. High-producing cows, however, should be milked more frequently. Whatever the periods, the milking should be done punctually and regularly, quietly and thoroughly, by intelligent, capable, cleanly and kind milkmen. If possible, milkmen should always milk the same cows; cows resent strange milkers. It is a good practice, supported by cow psychology, to let the milkman remove her calf and feed her a tempting ration of bran mash—she will adopt him and yield her milk to him willingly and liberally.—P. J. v. d. H. Schreuder, in the South African *Journal of the Department of Agriculture.*

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

***Maize* :—**	
Boone County White	J. Chittick, Kangaroo Valley.
	Manager, Experiment Farm, Berry
Craig Mitchell	K. W. D. Humphries, Muswellbrook.
Fitzroy	Manager, Experiment Farm, Grafton.
	A. M. Hooke, Taree.
	J. P. Mooney, Taree.
	F. W. Hill, Yarramalong.
Funk's Yellow Dent	N. C. Pyemont, "Moondarra," Gundagai.
Golden Beauty	A. M. Hooke, Taree.
Golden Superb	W. H. McMahon, Pola Creek, *via* Kempsey.
Golden Glow	W. A. McLeod, Ben Lomond.
	J. A. Reynolds, Ben Lomond.
Hickory King	J. Campbell, Wingham.
	W. Cole, "The Grange," Pambula.
Iowa Silvermine	H. Mallaby, Farm 1864, Griffith.
Large Red Hogan	G. E. Levick, Taree.
Leaming	Manager, Experiment Farm, Grafton.
	W. Ryan, Oxley Island.
Manning Silvermine	H. E. Smart, "Purfleet," Taree.
Pride of Hawkesbury	Dempsey Bros., Taree.
Sundown...	J. S. Whan, Llangothlin.
***Sweet Sorghum* :—**	
Honey	Under-Secretary, Dept. of Agriculture, Sydney.
Orange	Manager, Experiment Farm, Yanco.
Red Amber	Manager, Experiment Farm, Glen Innes.
Selection, No. 34	Manager, Experiment Farm, Yanco.
Selection, No. 61	Manager, Experiment Farm, Berry.
***Grain Sorghum* :—**	
White Yolo	P. A. R. Gersbach, Leeton.
Feterita	Manager, Experiment Farm, Coonamble.
Kafir	Principal, H. A. College, Richmond.
Manchu Kaoliang	Manager, Experiment Farm, Bathurst.
Milo	J. T. Maunder, The Wilgas, Pallamallawa.
***Dual-purpose Sorghum* :—**	
Darso	Manager, Experiment Farm, Glen Innes.
***Grass* :—**	
Elephant...	Principal, H. A. College, Richmond.
	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Yanco.
Kikuyu	Principal H. A. College, Richmond.
	Manager, Experiment Farm, Lismore.
	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Yanco.
	Manager, Experiment Farm, Cowra.
Wimmera Rye	Manager, Experiment Farm, Temora.

Potatoes:—

Batlow Redsnooth	E. M. Herring, "Sheen," Batlow.
Batlow Cross	E. M. Herring, "Sheen," Batlow.
Coronation	E. M. Herring, "Sheen," Batlow.
	J. A. Reynolds, Ben Lomond.
Early Manistee	G. W. Kelly, Caves-road, Oberon.
Early Rose	G. W. Kelly, Caves-road, Oberon.
Factor	G. W. Kelly, Caves-road, Oberon.
Langworthy	G. W. Kelly, Caves-road, Oberon.
Satisfaction	G. W. Kelly, Caves-road, Oberon.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Light Horse Breeding.

On 1st April, the administration of the Light Horse Breeding Scheme in Great Britain will be transferred from the Ministry of Agriculture to the War Office.

It is pointed out that there will be no material change of policy, nor any curtailment of the encouragement given in the past to light horse breeding in its several branches.

The policy of the War Office will be generally to grade up the quality of the light horses produced in this country, and to eliminate as far as possible the production of the type of horses which, owing to malformation, unsoundness, and general unsuitability, is unfit, not only for military, but for any useful service.—*The Veterinary Record.*

A Device to Determine the Maturity of Pears.

To Oregon Agricultural College is due the credit of developing a modern pressure test device to determine the maturity of pears. Though several tests of maturity were considered (writes Henry Hartman, Associate Professor of Pomology at the institution mentioned, in *Better Fruit*), it soon became apparent that any reliable test applicable to the pear must be based wholly or in part upon the physical rather than the chemical contents of the cells. The pressure test, which embodies this principle, is based upon the fact that during the growth and ripening of the pear there is a gradual and consistent lowering of the physical resistance to pressure or wounding of the outer tissue. The decrease, in the case of Bartlett, is close to 2 per cent. every twenty-four hours. This instrument merely expresses in convenient units the gradual change in resistance that takes place from time to time. The test has been in use for several seasons in some of the pear districts of Oregon and elsewhere, and, in the main, has given satisfactory results, not only as an indicator of picking maturity, but as an index of the condition of fruit in storage.

There is little doubt, it is stated, that this test, intelligently administered, would do much to prevent losses incident to the harvesting and storing of pears, but the tester is not a fool-proof instrument, and it is efficient only when operated by some careful person who has made a study of the factors involved.

Poultry Notes.

NOVEMBER.

JAMES HADLINGTON, Poultry Expert.

THE hatching and rearing season has produced its usual crop of troubles—bad hatching in some cases, losses in rearing in others, and in some cases both. That these troubles will occur every year to a certain extent is more or less inevitable; they are vicissitudes attendant upon the business of rearing chickens. At the same time, fully 90 per cent. of the losses in rearing are preventable.

These losses are not confined to any one class of incubator or brooder, but they occur more or less in all, and no matter what equipment is in use the operator is a prime factor in the case. The causes of losses in rearing may be classified as (*a*) wrong methods; (*b*) inefficient class of brooder; (*c*) disease.

Experience goes to show that disease is the least responsible for losses. Most poultry-farmers would classify these causes in the reverse order to that in which they are placed above. The fact is that though disease may appear to play the most important part, faulty brooding and bad methods are mostly responsible for the susceptibility to the diseases incidental to rearing chickens. A realisation of these facts would result in an immense saving of chicken life. It might be said at once that the underlying cause of brooding troubles is the lack of definite knowledge of the primary essentials of successful rearing. In this connection it might be well to remember that diseases are due to micro-organisms that are present more or less wherever poultry are kept, and only await conditions favourable to their development to spring into activity. This being so, it is only a commonsense proposition that preventive measures are those that promise most success in combating disease. We might go further with chicken diseases and say that only prevention is of any use.

Prevention of disease then should be the objective of every poultry-farmer. But in putting this forward I do not mean that the rearer of chickens should be always deluging his equipment with disinfectants. It is the experience of the writer that the farmer who does so is the one most often in trouble. It is not disinfectants so much as right methods that are required. Among these are included not only cleanliness, but such conditions as adequate ventilation, correct temperature, etc., which affect the health of the birds. One does not deluge one's own home with disinfectants to ensure the health and well-being of the inmates. Such a procedure might have been excusable in the early days of our knowledge of micro-organisms as causative agents of disease, but science in these times directs

its attention to more natural conditions of life—fresh air, sunlight, roomy dwellings, etc.

Unfortunately for poultry life it is for the most part subjected to the reverse of natural conditions. Under commercial poultry-farming conditions, artificiality prevails at every stage and the tendency is to attempt to fit the chickens to conditions rather than the conditions to the chickens. Herein lies the source of most of our troubles. Perhaps the greatest drawback to the industry in respect of the important work of rearing chickens is the multiplicity of ideas on almost every conceivable detail of this work.

Too Many Fads.

Very many beginners with ordinary good judgment would achieve greater success in rearing chickens if left alone by their would-be "neighbourly" instructors. In this connection I would emphasise that the instructions given in publications issued by the Department are quite sufficient to ensure success if faithfully carried out. If any doubt arises in this connection beginners would do well to visit one or the other, or both, of the Government institutions—the Government Poultry Farm at Seven Hills or the Hawkesbury Agricultural College—and see for themselves the result of the system in operation. Thousands of strong, lusty chickens are to be seen, and they came through no other channel than the equipment in use there—no more expensive than is to be found on the average well-laid-out commercial farm.

Looking back over the mistakes that have cost farmers so dearly in the past, two stand out prominently, viz., failure to supply sufficient warmth, and the many fallacies that attach themselves to the business of rearing chickens. If one set out to write a book on what not to do, imagination would fail to conjure up one-half of the wrong directions that are followed, much of it on the advice of persons of limited experience. The result is enormous losses that are preventable. Many poultry-farmers appear not to know that the Department is in a position to advise them until great loss has been sustained. Then again assistance is often sought in the wrong direction and disappointment is the result. Poultry-farmers seeking advice should communicate with the Under Secretary, and the trouble will then be immediately brought under my notice. It should be understood that my headquarters are in Sydney and not at any institution.

Yolk Absorption.

A very prominent fallacy that is going the rounds is in respect to the slow, or non-absorption of the yolk matter in baby chickens, and in consequence many have starved and ruined their chickens through over-anxiety in this matter. The facts in connection with the absorption might be stated as follows:—At hatching time, as is fairly generally known, the yolk passes into the abdomen of the chicken. This yolk is nature's provision for the sustenance of the chicken during the first stage of its existence.

In a natural state it would invariably be necessary, but in a state of domestication it is perhaps of less importance. With a view to facilitating the using up of this substance, my usual advice is to withhold food for thirty-six to forty-eight hours after hatching, at which time feeding should be commenced. Under normal conditions the yolk is absorbed in due course and no further notice need be taken of the matter as far as strong, healthy chickens are concerned, and it is useless to starve the weak ones.

Clusters of Eggs of Body Lice (*Menopon gallinae*).

Observe that the eggs are in clusters at the base of the feathers. The infestation is a heavy one.

This slow absorption, where it does take place, is due to the weak assimilative power of the chickens concerned; it should, therefore, be classed as an effect due to other troubles rather than a cause of trouble in itself. Poultry-farmers will do well to concentrate upon the conditions necessary to ensure strong chickens, follow the advice given with regard to the time to commence feed and dismiss all anxiety from their minds concerning this matter.

Another mistake that has come under notice very prominently this rearing season is in feeding chickens. In "Rearing and Feeding," a leaflet issued by the Department, advice is given to feed baby chickens on rolled oats for the first two days, to be followed by crumbly mash fed all day from that time onward, with chicken mixture for evening feed. This two

days has become extended to six days in many cases. Rolled oats by themselves are not a sufficient or suitable feed for so long a period, and it will be best if poultry-farmers would revert to the two days as recommended. The first handful thrown to chickens should be crumbled with the hands; after that the chickens will pick to pieces all they require themselves.

Poultry Parasites.

As the hot weather is approaching poultry parasites will become more troublesome, and in consequence extra attention should be paid to them. How to combat poultry vermin is often a problem with the beginner. The Red mite (*Dermanyssus gallinae*) is perhaps the best known, and, if we except fowl tick, the most troublesome pest of the poultry yard. For this, painting the perches with kerosene tar (which is known under different names), and spraying other parts of the poultry house that might be infested, with kerosene emulsion, the recipe for which has been given previously in these notes, will keep this pest under control. The same treatment is equally effective with fowl tick.

The hen body-louse (*Menopon gallinae*) and like species live entirely on the skin of the fowl and are mostly found in the cavity under the root of the tail and to lesser extent about the body. This parasite lays its eggs at the base of the feathers, principally about the posterior parts of the bird and sometimes under the wings. The illustration shows clusters of eggs as they appear in cases of heavy infestation. The main thing to be understood in connection with this parasite is that it is useless to spray houses or oil perches in an effort to control it. The methods of control in this case are either to clip off the masses of eggs or touch them very lightly with salad oil. *Kerosene should never be used, as it burns the skin.*

To rid the birds of the parasite itself there is nothing equal to flowers of sulphur dusted thoroughly through the feathers, using it as an insecticide. The sulphur to be effective must reach the skin. The process should be repeated in about eight days, when the trouble should be at an end for the time. Flowers of sulphur added to the dust bath is also an excellent preventive in such cases.

Alleged Blindness in Horses from *Cucumis Myriocarpus*.

For many years the blindness in horses which has occurred commonly and extensively at times in the western part of the State, has been attributed to the continued ingestion of the melons of this plant. Previous feeding experiments have failed to show that the melons produce any disturbance of vision, but it has been shown that ingestion of the vine itself leads to impaction of the colon. Further feeding tests of the melons have, therefore, been conducted this year and will be continued, as up to the present no ill-effects have been induced.—H. R. Seddon, Director of Veterinary Research, in a recent report.

Orchard Notes.

November.

W. J. ALLEN and W. LE GAY BRERETON.

Cultivation.

CONSERVATION of the soil moisture is of paramount importance at this time of the year to growers of all kinds of fruit, both deciduous and citrus, not only for the development of the forthcoming crop, but also for the welfare of the trees.

What form this cultivation will take will depend, of course, on conditions. If, through continuous showery weather, weeds have grown too large for the cultivation, it may be necessary to give a light ploughing, though if it is possible to do efficient work with the cultivator, it is preferable, in apple and pear orchards, to delay this ploughing till the bulk of the early summer spraying is completed. It may be mentioned here that the plough is the best cultivation implement, with the exception of course of some hand tools, being more thorough, and leaving a better and more lasting mulch than the cultivator. When the plough is used for cultivation during the summer months it should be set shallower than it is for the fall or winter ploughing. The cultivator, in most cases, cannot be dispensed with altogether, as often the ploughing cannot be completed quickly enough.

Pests and Diseases.

At this season of the year the deciduous fruit grower is especially busy protecting his trees from the ravages of pests and diseases; the citrus grower's time comes later.

In the tableland districts the first or calyx spray for codlin moth is generally completed by the latter part of October, and where the double application is made, continues into November. Growers should study Mr. Broadfoot's article on codlin moth control published in last month's issue, and note that now is the time to carry out certain phases of control methods, and also that "now" will continue for the next few months in respect of this season's campaign against codlin moth.

In districts where apples and pears are liable to attack by black spot, weather conditions will decide whether it is necessary to continue using a fungicide combined with the lead arsenate applications. If continual moist weather occurs the disease will continue to develop and it will be necessary to check it with sprays. Lime-sulphur and Bordeaux mixture are the chief fungicides used for black spot of the apple and pear. Pamphlets regarding these sprays may be obtained on application to the Department.

Bordeaux is the more efficient fungicide, but is liable to russet the fruit, and for this reason in districts where the disease is not generally very

severe and lime-sulphur is sufficient to check it, it is preferable to use lime-sulphur. Bordeaux mixture applied six weeks after the setting of the fruit will not cause such severe russeting as when applied at calyx stage.

When combining lime-sulphur for black spot with lead arsenate, care should be taken in the way mixing is carried out. The concentrated lime-sulphur should first be diluted with all but a few gallons of the full quantity of water required to reduce it to the correct strength. The lead arsenate should be reduced to a thin cream with the few gallons of water left out, and this cream then stirred into the diluted lime-sulphur, care being taken that the mixture makes the correct total volume. Care should also be taken that the relative quantities of concentrated lime-sulphur and lead arsenate to the total quantity of fluid are maintained. The combination should be used at once and not held for any length of time. The same care should be exercised when mixing Bordeaux mixture and lead arsenate or other combinations. Where woolly aphis is present, tobacco wash may be combined with lime-sulphur or Bordeaux, or with lead arsenate, but in this case no soda should be used in making the tobacco wash.

In some districts lime-sulphur has kept apple powdery mildew in control, but in others it has not, and in these latter districts it is necessary to apply some finely divided sulphur spray, such as colloidal, atomic or atomised sulphur at from spur burst to pinking stage, and to combine it later with lead arsenate sprays. These sulphur sprays do not retard the growth of the apple tree or fruit as lime-sulphur or Bordeaux does (especially during a dry season) if continued with each lead arsenate application.

Where woolly aphis of apple or black aphis of peach are present, a drenching application of tobacco wash or one of the commercial nicotine extracts should be made at high pressure. If any peach aphis are found alive within two or three days after spraying, repeat the operation at once; do not give them time to breed up again.

The initial spraying of grape vines for black spot should have been completed before this; whether later applications are necessary for this disease will depend on weather conditions, but because of the danger of downy mildew and the rapidity with which this latter disease can spread, it is not wise to cease applications of Bordeaux mixture till later in the season. Bordeaux mixture is the best fungicide for both black spot and downy mildew of the grape vine.

Flowers of sulphur are used for oidium or powdery mildew of the grape vine. Leaflets giving the treatment for the various diseases and pests of the vine and the mixing of the various sprays mentioned above are obtainable from the Department.

Cherry growers should keep a close watch on their trees for the cherry and pear tree slug. Control is easier if the pest is dealt with promptly before it has bred up in great numbers. If it first appears just as the cherries are ready for market, spraying must be delayed until the picking is completed. Lead arsenate and tobacco wash or one of the nicotine extracts

makes a good combined poison and contact spray for this pest, the lead arsenate remaining on the leaves to poison those that are not killed by the tobacco or nicotine extract.

Thinning of Fruits.

The growers of early stone fruits in the North Ryde and surrounding districts carry out fruit thinning most systematically, and it would be to their advantage if growers in other districts would follow this example on trees that have set too heavily. Many of the early coastal grown peaches are ready to thin during October, but there are many kinds and varieties of fruits in our later districts which should be left till later.

As a general principle it is wise to wait till the shedding of stone fruits has taken place about the time the stone is hardening. The final shedding of apples and pears should be allowed to take place before hand thinning is started. When thinning these latter fruits the stalks should be broken at their junction with the fruit, leaving the stalk adhering in the cluster; their complete removal will often disturb the stalks of the remaining fruit and cause the fruit to fall. Likewise if the lower fruits of a cluster are removed the upper fruits which they are supporting will often drop. It is only in the case of heavy settings of apples and pears that are small, such as Trevitt's and Winter Cole, that thinning is necessary.

THE MANURIAL VALUE OF "BLACKS' OVENS."

"I AM forwarding you a sample of soil taken from what is commonly known as 'blacks' ovens.' Spread on pasture land it seems to give good results as a manure, and I would like to be advised as to whether it would be of any use as a manure on citrus and vines under irrigation. On stiff clay land it has a tendency to make the soil more pliable and open."

The deposits referred to by the above correspondent are scattered over a fairly wide area on the Murray. Analysis of the sample forwarded showed that 1 ton of the product would contain 4·7 lb. nitrogen, 9·4 lb. potash, and 5·7 lb. phosphoric acid, and at prevailing fertiliser values would be worth about 7s. 6d. The application of the substance to a soil should be beneficial, but the amount available is limited, and the matter of local importance only.—A. A. RAMSAY, Chemist.

CIRCUMVENTING BLUE MOULD OF TOBACCO.

A LARGE number of varieties of tobacco imported from America were tested last season at Bathurst Experiment Farm for resistance to blue mould. No outstanding results were obtained, and tests are being repeated this year. There were indications, however, that loss from blue mould may be much decreased by the use of varieties which are of an upright-growing habit, with the foliage well spaced out to give good air circulation. It should be possible to breed such types for local conditions.—J. P. SHELTON, Plant Breeder.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1924.

Society.	Secretary.	Date.
Lismore A. and I. Society	H. Pritchard	Nov. 18, 19, 20
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	" 26, 27

1925.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 9, 10
Dapto A. and H. Society	E. G. Coghlan	" 16, 17
Northern Suburbs A. & H. Association (St. Ives)	F. Conway	" 16, 17
Kiama A. Society	G. A. Somerville	" 24, 26
Wollongong A. H. and I. Association	W. J. Cochrane	" 29, 30, 31
Yanco Irrigation Area A. Society (Leeton)	W. Roseworn	Feb. 10, 11
Moruya A. and P. Society	H. P. Jeffery	" 10, 11
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	" 13, 14
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	" 13, 14
Guyra P. and A. Association	P. N. Stevenson	" 17, 18, 19
Pambula A. H. and P. Society	L. K. Longhurst	" 18, 19
Milton A. and H. Association	F. W. Cork	" 18, 19
Nimmitabel A. and P. Association	R. K. Draper	" 24, 25
Uralla P. and A. Association	D. T. McLennan	" 24, 25, 26
Newcastle A. H. and I. Association	E. J. Dann	" 24 to 28
Blacktown A. Society	J. McMurtrie	" 27, 28
Bega A. P. and H. Society	H. J. B. Grime	Mar. 3, 4
Braidwood P. and A. Association (Jubilee Show)	R. L. Irwin	" 3, 4, 5
Yass P. and A. Association	E. A. Hickey	" 4, 5
Manning River A. and H. Association (Taree)	R. Plummer	" 4, 5, 6
Oberon A. H. and P. Association	S. Marsden	" 5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	" 5, 6, 7
Mudgee A. P. H. and I. Association	R. Shaw	" 10, 11, 12
Cobargo A. P. and H. Society	T. Kennelly	" 11, 12
Narrabri P. A. and H. Association	V. W. Jones	" 11, 12
Batlow A. Society	C. J. Gregory	" 17, 18
Dungog A. and H. Association	W. H. Green	" 18, 19, 20
Crookwell A. P. and H. Society	C. H. Levy	" 19, 20
Cumnock P. A. and H. Association	K. J. Abernethy	" 18
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	" 20, 21
Rydal A. H. and P. Society	S. Bruce Prior	" 20, 21
Blayney A. and P. Association	H. R. Woolley	" 24, 25
Cooma P. and A. Association	C. J. Walmsley	" 25, 26
Goulburn A. P. and H. Society	F. D. Hay	" 26, 27, 28
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	April 1, 2, 3
Royal Agricultural Society of N.S.W.	K. J. Raffety	" 6 to 15
Gloucester A. H. and P. Association	F. S. Chester	" 22, 23
Richmond River A. H. and P. Society (Casino)	P. M. Swanson	" 22, 23
Orange A. and P. Association	G. L. Williams	" 28, 29, 30
Clarence P. and A. Society (Grafton)	L. C. Lawson	" 29 to May 2
Hawkesbury District A. Association (Windsor)	H. S. Johnston	" 30 to May 2

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Impressions of Wimmera Farming Methods.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

THE majority of the land found in the Wimmera district in Victoria consists of a heavy black clay; indeed, this is the typical first-class black Wimmera soil. In the virgin state it is "crab-holey," but with cultivation the crab holes are gradually filled up, and the land then presents a level appearance.

This soil contains a very high percentage of clay and also a considerable amount of lime. According to its physical composition it should behave badly under cultivation, but for some reason, as yet unexplained by science, it behaves very well indeed. It can be ploughed and worked while rather wet without being thrown out of condition, and it can be cultivated frequently and the surface reduced to a fine tilth without adversely affecting its texture. Instead of behaving as one would expect, this peculiar soil crumbles up into small squares and forms a natural mulch—hence the term "self-mulching."

In addition to this black soil, large areas occur of what is called the red Wimmera country, which also is "self-mulching" and is worked in much the same manner as the black.

There are also to be found small areas of heavy clay country dotted through the typical black and red Wimmera lands. This clay soil is very difficult to work, is not "self-mulching," and the general Wimmera methods cannot be applied to it. Here the system adopted is somewhat similar to that practised in the Riverina; the land is ploughed in June and a cloddy surface is maintained. It is not cultivated except when absolutely necessary, as if too fine it will run together and set hard after rain. This land does not give quite such high yields as the best black or red soil, but with the system of working outlined above it gives quite good yields. This clay country must be sown early in the season, otherwise there is a danger that if wet weather sets in it cannot be planted.

The farmers on the black land possess a great advantage in that they can delay sowing, and yet be quite sure of getting their crop in. It is possible to continue drilling soon after rain on account of the peculiar nature of the soil. This black land can be ploughed with ease even in the middle of summer when quite dry, and without turning up cloddy; in fact, it turns up more like ashes than anything else, and is easier to plough in summer than in winter

Cultural Methods.

Of the wheat grown in this district, 90 to 95 per cent. is on fallow; the stubble land does not produce payable wheat crops. For some time the system adopted was to plough in June and then cultivate frequently with a cultivator or Wimmera scarifier: at times harrows only were required.

Under this system a typical treatment would be as follows:—

July—plough and harrow.
August—scarify and harrow.
September—scarify and harrow.
October—cultivate with springtooth cultivator; after summer rains—harrow.
April—scarify and harrow.

In recent years, however, summer fallowing has been more universally adopted, and with great success. In this case the land is ploughed four months earlier (February or March), thus giving about sixteen months' fallow. This results in the production of cleaner crops, and it is claimed it increases the yield. This early burning of the stubble is a great factor in destroying insect pests and their harbour, and it also checks fungous diseases such as flag smut, take-all, and foot-rot, as a much better burn can be obtained at this time of the year and the heating of the surface soil assists in destroying many fungus spores. Although the Victorian Department of Agriculture has no accurate data on the question of summer fallowing, the majority of Wimmera farmers follow this system.

Instead of ploughing the land in summer, many farmers use the set Wimmera scarifier. In stumpy country the stump-jump scarifier is substituted. This machine is sometimes preferred simply because it is heavier, and so it is adopted for use on the heavy red country. Land fallowed with these implements is not ploughed in the winter; it is simply cultivated at intervals, as described for the previous system. If the land is too hard to summer fallow with a scarifier, the plough is used, going only 2 or 3 inches deep.

The fallow will be cultivated from eight to twelve times in all. The surface is reduced to a very fine tilth, but, as explained before, it does not form a hard crust after rain. The fact that the land does not break up into a cloddy condition when first ploughed, combined with the great number of cultivations received, brings about a better consolidation of the seed-bed than can be obtained under our soil conditions.

After the land is ploughed or scarified, as the case may be, the scarifier or springtooth cultivator is used to destroy weeds, a stroke of the harrows usually following. From three to seven cultivations are given before harvest, and three to four additional after harvest and before seeding. The harrows are usually sufficient for these latter cultivations, as by that time the land is free from weeds, and the only object is to conserve moisture.

A striking feature of the land around Horsham and Warracknabeal, and in fact, most of the Wimmera country, is the prevalence of black oats. The land seems to be literally full of black oats, and it is only the thorough working of the fallows that enables a comparatively clean crop to be produced. The scarifier with 8-inch points is depended on to clean the land of oats.

Before leaving the subject of cultivation, reference should be made to the skeleton mouldboard ploughs. This type of plough is universally popular throughout the Wimmera. It is claimed that this plough can be used after rain much sooner than the full mouldboard; also the draught is lighter to the extent of one horse less in a four-furrow plough. It also does not need to have the boards scraped, as an ordinary plough does in most land. It will not, however, do neat work, though this is not an important consideration. This type of plough would be worth testing in the Riverina.

Seeding.

The most popular variety in the Wimmera is Federation, about 80 per cent. of the wheat grown being of this variety. Wannon, which is a selection from Federation, is of late years attracting attention. Huff's Imperial (another wheat of the Federation type) and Minister are also grown to some extent.

The formalin treatment for the prevention of bunt is usually adopted. Copper carbonate is not yet used to any extent. In this respect Wimmera farmers are behind the Riverina farmers, who have appreciated the great advantages of the dry treatment, and have been quick to adopt it.

The rate of seeding is usually 75 to 85 lb. per acre. It was demonstrated at Longerenong College (average annual rainfall 15 inches) that for each 15 lb. of seed used over 45 lb. the increase in yield was in the vicinity of a bushel per acre.

Seeding is not commenced until late in the season—usually July. Late sowing gives cleaner crops and the crops are more free from flag-smut and other fungous diseases than when sown early. In addition the crop is shorter and consequently less liable to lodge, and also is more drought resistant. As before stated, the peculiar nature of the soil makes this late sowing possible. Rain does not delay the farmers on the black soil to any extent. Unfortunately, Riverina farmers cannot leave their sowing until July as the land there cannot be sown in wet weather and farmers would run the risk of not getting the crop in at all.

While the majority of farmers use the ordinary seed drill, sowing 7 inches apart, a few are experimenting with an attachment which places the rows 3½ inches apart. It is thought that this distributes the seed and superphosphate more evenly and that it helps to choke any weeds. A good crop sown in this way was seen at Warracknabeal, where 80 lb. of Federation had been sown with 170 lb. superphosphate. There is at present no accurate data as to the merits of this 3½-inch sowing. The disadvantages which suggest themselves are that the drill would be inclined to clog up in dirty or stubble country.

Fertilisers.

Without superphosphate wheat-growing in the Wimmera and Mallee would be a very poor occupation. It is found that heavy dressings must be applied to obtain big yields. As a rule about 1 cwt. per acre is used. The tendency is towards still heavier dressings, and some crops were inspected on private farms which had received as much as 170 lb. per acre. At Longerenong College the usual dressing is 140 lb. per acre.

On the majority of wheat soils in the Riverina, we cannot profitably apply such heavy dressings. The Department has tested this matter thoroughly in the farmers' experiment plots at different centres, and the results indicate that for most soils in the Southern district from 60 to 100 lb. of superphosphate per acre is the most profitable application.

High-grade superphosphate (22 per cent. phosphoric acid) is being largely used, instead of the ordinary 16 to 18 per cent. superphosphate. With heavy dressings, the high-grade superphosphate gives excellent results, but it is found that when small dressings are used the results are not so good. This is perhaps due to the better distribution obtained with the lower grade.

Rotation.

A rotation of wheat, oats, and fallow is generally adopted, a crop of wheat being produced every third year. Very little hay is grown, farmers simply growing enough for their own use. The oat crops are invariably grown on stubble land and seldom give very high yields. The wheat stubble is burnt and the oats sown with a combine. This accounts for the poor oat crops seen throughout the district. The average oat crops are not so heavy as those grown in the Riverina.

Not so many sheep are carried on the wheat farms as in New South Wales. This is due slightly to the lower grazing capacity of the land, but chiefly to the system of cultivation. There is, indeed, very little room for sheep on these intensive wheat farms, as the stubbles are always burnt off early, and the land summer-fallowed as soon as possible. Again, by reason of the frequent workings, very little rubbish grows on the fallows.

A practice favoured in the Wimmera in a good season is to cut more oaten hay (on the ripe side) than is required, and to stack the crop in expectation of a drought. If the hay is not used it is threshed in the following year, and the straw is stacked as reserve feed for dry times

Horses.

The Wimmera is remarkable for the excellent class of Clydesdale to be seen on every farm. Not one inferior team was to be seen around Horsham and Warracknabeal, and the great number of first-class Clydesdales seen at the Horsham show was astounding.

Tractors are not very popular in the district; the majority of the farmers much prefer the horses. One of the reasons put forward is that the tramping of the horses greatly assists in the consolidation of the subsurface soil. For

this reason the horses are in most instances driven abreast so that the trampling is more evenly distributed over the land. Ten, twelve, and up to fourteen horses are driven abreast in scarifiers and harrows. The horses are are not always driven abreast when ploughing.

The Wimmera-Mallee Water Supply.

A gravitation scheme, which makes use of Taylor's Lake, Pine Lake, Lake Lonsdale, Wartook and Fyan's Lake, stores sufficient water to supply, by means of open channels, the towns and individual farmers with water. This has been of great assistance to the settlers. The majority of the land bordering the Wimmera River is quite level, and farmers would have difficulty in filling their dams by natural means. No strict limit is fixed on the quantity of water supplied to any individual farmer. The scheme is a paying proposition, each man paying a small charge according to the water supplied him.

The water supply has made a wonderful difference to the towns, which present a prosperous and inviting appearance. Almost every street has its avenue of trees, chiefly sugar gums. The public parks are attractive, and the private homes are made beautiful by well-kept gardens. In the Riverina only those towns fortunate enough to be situated on the river have beautiful gardens and parks, sewerage systems, &c.

The prosperity of the towns served by the Wimmera and Mallee water scheme certainly indicates that one of the best means of checking the drift to the city and increasing rural population is to provide the country town with a satisfactory water supply.

Conclusions.

The main factors contributing to the heavy wheat yields obtained in the Wimmera are:—Heavy dressings of seed and superphosphate, the great amount of moisture stored in the fallows, and the better consolidation of the seed-bed, combined with the fact that wheat can be sown late, thus ensuring crops reasonably free from weeds and disease.

The system of cultivation which has been devised in the Wimmera, while admirably suiting this particular soil, is, unfortunately, not appliable to the red wheat soils of the Riverina. However, in the Riverina there are quite extensive areas of country somewhat similar to the Wimmera. This is the heavy, black "crab-holey" land on which "boree" is usually found. It is very fertile, being wonderful grazing country, and producing heavy crops of wheat in suitable seasons. It is somewhat "self-mulching," but not to the same extent as the Wimmera soil. I consider that Wimmera cultural methods could profitably be adopted on this country.

The "boree" country is not quite so easily worked as the Wimmera, nor can it be cultivated quite so soon after rain; in addition, it would not be advisable to delay the sowing as late as July, as there would be a risk of not getting the crop in at all.

One remarkable feature of the Wimmera district is the uniformity of the farming methods. The most profitable system of cultivation has been decided upon, and practically every farmer follows this system. The best methods for the district are universally adopted; there are very few rough farmers. This uniformity has been achieved by propaganda.

To my mind the Wimmera strongly suggests one means of increasing the wheat yield, and that is to even up the standard of farming. There is too much difference between the yields obtained by our best and our worst farmers. If all the farmers in a district could be persuaded to adopt the methods of the most successful man a considerable increase in the average yield would result.

This objective is attainable, and perhaps may soon be realised. The various agricultural societies in New South Wales have laid the foundation by conducting fallow and crop-growing competitions. The only important point that has not received sufficient attention is the publicity and propaganda. At present it is only the most progressive farmers who take any great interest in the competitions. This state of affairs should be altered and an endeavour should be made to interest also the backward farmer. The educational opportunities afforded by crop and fallow competitions are enormous If, in addition to entering his crop, each farmer made an effort to accompany the judge throughout the judging (as is done in some districts) a more complete understanding would follow, and the most successful methods would receive wide publicity.

The success of the Wimmera is in no small measure due to the activities of of the agricultural societies, and there is every reason to expect that the soci ties in the Riverina, for example, are capable of accomplishing the same educational work among the farmers if the matter is taken seriously in hand.

The Romance of the Soil.

How many farmers know anything about the remarkable structure of the soil they till, of its fascinating history, of the teeming population of living organisms that dwell in its dark recesses? How many know of the wonderful wheel of life in which the plant takes up simple substances and in some mysterious way fashions them into foods for men and animals and packs them with energy drawn out of the sunlight—energy which enables us to move and work, to drive engines, motor cars, and all the other complex agencies of modern civilization? No one knows much of these things, but if we knew more, and could tell it as it deserves to be told, we should have a story that would make the wildest romance of human imagination seem dull by comparison, and would dispel for ever the illusion that the country is a dull place to live in. Agricultural science must be judged not only by its material achievements, but also by its success in revealing to the countryman something of the wonder and the mystery of the great open spaces in which he dwells—Sir John Russell, Director, Rothamsted Agricultural Experiment Station, England.

Farmers' Experiment Plots.

POTATO TRIALS, 1923–24.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

POTATO trials were carried out last season in co-operation with the following farmers :—

J. G. Ward, Sherwood, Macleay River.
J. G. Smith, Wauchope, Hastings River.
J. Mooney, Cundletown, Manning River.
J. Percy Mooney, Dumaresq Island, Manning River.
F. Poole, Tinonee, Manning River.
R. Dyball, junr., Taree Estate, Manning River.
W. Smith, Paterson.
J. G. Perrett, Miller's Forest, Hunter River.

The season was one of the driest experienced on the coast. The rainfall during the winter months was insufficient to give the subsoil a thorough drenching, and on farms where the ploughing operations were not conducted until late in the season, this had a disastrous effect; for with practically no moisture conserved, followed by a spring with very light rainfall and much wind, the crops in most instances failed to "hang out," and poor yields resulted. The drought did not break until December—too late for the potato crop. It has been proved, on the lower North Coast at any rate, that unless a good fall of rain occurs prior to the middle of October, the majority of the crops (usually August-sown) are too far advanced to derive the full benefit of any that falls much after that date. New potatoes in small lots were available at the end of October in the district.

Slightly better conditions prevailed on the Macleay than in other sections, and yields here were fair. On the Manning and Hastings the rain that fell was of no use, being in small lots. The plot at Dumaresq Island was sown on new land that had been prepared early, and as this neighbourhood is notorious for its drought-resisting powers, the yields were quite the best obtained. This was the only plot worth digging on the Manning. Further south, only one plot—that at Miller's Forest—was dug, and in no case did the yield exceed 1¾ tons, mostly of small tubers.

The rainfall was as follows :—

Month.	Sherwood.	Dumaresq Island.	Miller's Forest.
1923.	Points.	Points.	Points.
August	269	—	115
September... ...	110	172	*
October	154	148	*
November... ...	34	223	82

* None worth recording.

Only four varieties were available for sowing—a red, a blue, a pink, and a white. Factor (the white variety) yielded best at Sherwood, where it usually tops the list. Previously it has not yielded as well as Up-to-date in other parts of the district. Early Manistee, although not a heavy yielder, is becoming very popular, and is now largely grown. Early Manhattan is usually reliable, but is not a good seller.

In the manurial trials 5 cwt. superphosphate gave the best results at Sherwood, and 4 cwt. P9 the best at Miller's Forest, but the season was really too dry for much importance to be attached to the figures.

RESULTS of Variety Trials.

Variety.	Sherwood. (Sown 16th Aug.)	Dumaresq Island. (Sown 1st Sept.)	Miller's Forest. (Sown 16th Aug.)
	t. cwt.	t. cwt.	t. cwt.
Factor	5 10	8 2	1 15½
Satisfaction ...	4 8	6 19	1 15
Early Manistee ...	3 3	7 9	1 8
Early Manhattan...	1 19	7 6	8 8½

RESULTS of Fertiliser Trials.

Fertiliser per Acre	Sherwood.	Miller's Forest.
	t. cwt.	t. cwt.
No fertiliser	1 19	1 8½
Superphosphate, 2½ cwt.	2 2	1 9
Superphosphate, 5 cwt.	2 19	1 9½
P9, 4 cwt.	2 0	1 11

The variety used was Manhattan. P9 consists of superphosphate 10 parts, chloride of potash 3 parts, and sulphate of ammonia 3 parts.

No yields were available at Wauchope, Cundletown, Taree Estate, Tinonee, or Paterson.

PRUSSIC ACID IN *Indigofera australis*.

AMONG the plants suspected of being harmful to stock is native indigo (*Indigofera australis*). Reference to the available literature on the subject indicates that the presence of hydrocyanic (prussic) acid in this plant has not been recorded, and that examinations of the plant have given negative results. Investigations now being carried out at the chemist's branch of this Department show, however, that hydrocyanic acid is undoubtedly present. The plant in the green state contains ·102 per cent. hydrocyanic acid, which is equivalent to 7·14 grains hydrocyanic acid per pound of plant. One grain of hydrocyanic acid is a lethal dose for a sheep, and this amount would be contained in about 2½ ounces of the plant. Native fuschia (*Eremophila maculata*) is regarded as one of our worst poison plants, and the *Indigofera* examined appears to be quite as potent.—A. A. RAMSAY, Chemist.

Black Soil under Irrigation with Bore Water.

Results at Coonamble Experiment Farm.

R. W. McDIARMID, H.D.A., Manager.

ARTESIAN bore water has been used for irrigation purposes on this farm for seven or eight years, and with such success as to justify the recommendation of the practice to farmers and graziers who are similarly circumstanced.

A certain amount of prejudice exists against the use of bore water in this way on account of the effect of salts which are supposed to be deleterious to the soil, but the experience here does not indicate any need for concern on that account. None of the paddocks irrigated seem to have suffered in any way, and they grow as heavy crops to-day as ever. Even at the borehead, where the temperature of the water is 97 deg. Fah., the vegetation grows luxuriantly, and along the whole length of the channels there is abundance of grasses and trefoil. According to analysis the water apparently contains a fairly heavy proportion of detrimental salts, but by having several paddocks properly laid out for irrigation and using them in rotation, so that the soil in each is able to mellow down and sweeten before it is again brought under crop and irrigation, there seems no reason why the method should not be continued indefinitely. The analysis made in May, 1916, was as follows:—

	Sodium Carbonate.	Potassium Carbonate.	Calcium Carbonate.	Magnesium Carbonate.	Sodium Chloride.	Sodium Sulphate.	Silica.	Ferric Oxide and Alumina.	Total.
Grains per gallon ...	6·566	3·679	11·401	2·141	1·508	2·080	1·400	Trace	28·775
Grains per 1000 parts..	0·0938	0·0526	0·1629	0·0306	0·0215	0·0297	0·02	...	0·411

No traces of boric acid were detected.

A second objection urged against irrigation with bore water is that it has been tried by some with disappointing results, but in most such cases it will be found that the water has simply been turned on without any provision having been made for draining it off so soon as the land has been sufficiently soaked, and the water has been allowed to lie on the surface, producing a bog in which nothing would grow.

Proper Preparation of the Soil Essential.

If irrigation is to be attempted in this district, it must be with just as careful preparation of the land as on the Murrumbidgee Irrigation Areas,

so that a limited quantity of water may be turned on, and that it may be drained off again at the proper time. All this involves the construction of drains to take the water off, just as much as of channels to run it on, and it also involves the construction of check banks and the grading of the land between, so that each area shall receive the correct amount of water. Without such grading the water will lie in certain places and will not reach others, the result being that the seed will be rotted in the one case and not germinated (except by rain) in the other.

The black, open plains lend themselves most naturally to irrigation, the land being almost flat with a gentle fall (on this farm) to the north-west. The enormous expense and labour necessary in some districts in the preparation of the land is not required here, and the channels, check banks, and drains mentioned above are easily and inexpensively constructed. The heavy black soil is richer and absorbs more water than the light soils, becomes friable sooner after irrigation, and readily works down again for future crops. The heavy crops that this soil will produce, providing moisture is present, amply justify the outlay, and the farm or station that devotes an area to the growth of fodder crops under irrigation is paying into an insurance fund whose premiums are very low.

It has been found that it is not necessary to plough the black soil every year, even after flooding. The springtooth cultivator is quite capable of preparing an ideal seed-bed, and the cost of ploughing and of levelling off again afterwards to ensure even watering is saved. Ploughing every third year appears to be ample; in fact, in 1923 a splendid crop of Japanese millet was grown on a 30-acre paddock that had not been ploughed for many years. The seed was simply run in with the drill after the cultivator, and nothing further was necessary to cover it.

Making the Channels and Drains.

The formation of the channels and larger drains is cheaply effected by means of a large delver constructed on the farm and illustrated on page 847. It consists of a heavy main beam of 9 x 7 inch timber, 18 feet long, with a wing piece of 18 x 2 inch timber, 10 feet long. A short heavy log of 9 x 7 inch timber is bolted to the front of the long beam with the object of keeping the draught high and thus preventing the implement being drawn out of the ground. The front of the main beam is shod with ¼-inch plate iron with a steel cutting edge. The wing piece, which is shod with iron from end to end, is hinged to the main beam 2 feet from the point, and is held off the main beam with spreader bars of 4 x 1 inch iron which hinge from the wing itself, fitting into holes in the main beam. It takes a team of eight or ten horses to draw this implement, which does excellent work, serving admirably for finishing off the large drains, though the first part of the work has to be done in the ordinary way with the plough or the grader. The work is best done when the soil is quite dry and free.

The main channels should be at least 10 feet wide from the centre of one bank to the centre of the other. It looks big, but large channels not only hold up more water and enable the land to be flooded more quickly, but

they cause much less trouble in the matter of cracks and of loss by soakage through cracks than small channels, which on the black soil often break away and allow a good deal of water to go to waste.

The distance between the channel and the drain by which surplus water is to be drawn off should not exceed 7 chains. It is found that if the distance is greater, the water takes so long to flow from the upper to the lower end of the block that much of the seed, especially at the upper end, is rotted.

In order that the water may be properly controlled, the formation of check banks which run between the two channels, subdividing the paddock into a series of small blocks, each of which can be watered separately, is

Delver for Forming Irrigation Channels and Drains.
Made and used on Coonamble Experiment Farm.

quite essential. These should not be more than 1 chain apart, and the more uneven the land the closer they must be together in order that the watering may be uniform.

Making Check Banks and Grading.

The land having been ploughed carefully, the check banks should be marked out with the plough or grader at the intervals determined upon, and then the job completed with a smoother or leveller. This implement is operated so as to form the check banks by drawing the soil up as required. In black soil country the banks require to be wider than in lighter soils, owing to the greater soakage in the heavy soil and the risk of the bank being washed away.

The smoother used on this farm is illustrated on page 848. It consists of two pieces of oregon, each 12 x 4, and 12 feet long, which are set exactly parallel to one another, but with the rear one upright, and the

front one at an angle of about 70 degrees to it. The actual distance between these two logs is 2 feet 1 inch at the bottom and 1 foot 11 inches at the top. They are tied together with three 4 x 4 inch timbers, and four ¾-inch bolts, that pass right through both. The draught is from the two end bolts. The front piece is shod with 4 x ⅝ inch steel. A sheet of boiler plate (or of timber if preferred) passes from the top of the front log to the bottom of the back one, the effect of this being that the machine rides over the soil when the front is tipped up, while it picks up a varying amount of soil when it is tipped forward. The angle at which the smoother passes over the land is determined by the driver who stands on a 5 x 2 feet platform, made of 12 x 2 in. oregon, that is placed in the middle. When the

Smoother, used for Forming Check Banks and levelling "Checks."
Made and used on Coonamble Experiment Farm.

driver stands forward the smoother gathers earth, and when he steps backward the smoother rides over the earth. An intelligent man can, with a little practice, form the check banks quite accurately. In order that any irregularity between the check banks may be levelled up, it may be advisable to run the smoother up and down each plot. The rises and depressions can then be cut off and filled up almost exactly, and all the troubles attendant upon uneven watering prevented.

Sowing and Harrowing.

When it comes to the sowing of the land, the black soil demands special treatment. The recognised method of irrigating and then drilling in the seed is a complete failure on the heavy soil, and the only successful way is to sow on a dry seed-bed and then to apply water to germinate the seed. The depth of sowing must also be shallower on the heavy soil than is usual.

Wheat, oats, barley, Japanese millet, Sudan grass, and the like may be sown with the drill either parallel with or across the check banks, and then furrows should be opened in the same direction as the check banks, every 3 feet apart and about 3 to 4 inches deep. These furrows convey the water the length of the check, allowing it to soak from one to the other without the ground being flooded. If the checks are longer than 7 chains from channel to drain, the distance between the furrows can be increased up to 7 or 8 feet, the actual distance being determined by the capacity of the soil for lateral soakage. The ideal condition is where the soakage from one furrow to another has met in the middle by the time the water has reached the lower end of the furrows. The furrows are best made with the ordinary springtooth cultivator by removing all but two or three tines, according to the desired distances apart, and replacing the ordinary points by wide ones specially made to leave a furrow about 8 or 9 inches wide.

With maize and one or two other crops, the only satisfactory way of securing germination is first to cultivate the whole area, then to open up good deep furrows about 3 or 4 feet apart, sow the seed with the maize-dropper along between the furrows, and finally to turn the water into the furrows. Water over the top of the maize seed is fatal to germination, so that the water must be carefully confined to the furrows all the time it is being applied.

Crops Suitable for Grazing.

As this is essentially a grazing district, the crops suitable for grazing purposes may be dealt with first.

Trefoil.—The most important is certainly the trefoil that, without sowing, springs up so plentifully after rain or irrigation, and usually makes such luxuriant growth with a couple of waterings. If the trefoil is started in March, a very heavy growth, with an enormous carrying capacity, is obtained by June. It was under such conditions as these that the 840 sheep referred to in another article in this issue (page 866) were grazed on 14 acres for one month in the present spring.

Provided the surplus water is promptly removed, ordinary flooding secures a perfect germination of the trefoil, which, if not required at once for green feed, can be converted into silage or hay in the spring.

Lucerne is the most valuable of all grazing propositions, of course, but considerable care must be exercised in watering it, for the plants will be drowned out if covered with water, even for a few days. Lucerne makes its best growth here in the cooler weather, and its feeding value is then considered higher than at other times, even for hay purposes.

Sowing should be carried out in April and May or in August, the months of June and July being risky, owing to the possibility of frost killing the tender seedlings. If drilled the seed should be sown at the rate of 10 to 12 lb. per acre; if broadcasted the sowing should be a little heavier. The seed must not be covered deeply, and if water is applied carefully by the furrow system a very satisfactory germination should be secured.

Usually the winter rains give a good growth for the first cutting in September, but after that the stand should be watered for each cutting.

The summer growth is much shorter and lighter than that obtained during cool weather, and the hay must be cured more rapidly in the heat or the leaf will be lost. The spring cutting usually makes beautiful brown hay, which is much preferred by farm stock.

Barley.—Skinless barley for early maturity and Cape barley for heavy yields grow well under irrigation here. The seed should be sown in autumn —March to May—and germinated by watering along furrows previously made. Once above ground, barley will stand plenty of water, and as trefoil usually comes away with it in luxuriant growth, a very heavy crop of well-balanced fodder is obtained, which can be grazed off or cut with the reaper and binder and pitted as silage.

The amount of seed to be sown ranges from 40 to 60 lb. per acre, according to whether it is drilled or broadcasted. If the growth of barley is too thick the trefoil does not come well, and the fodder suffers in feeding value accordingly.

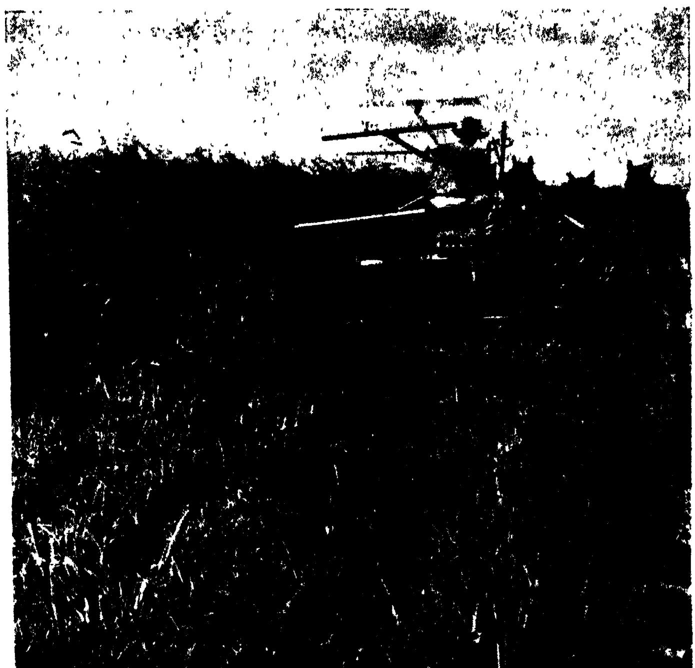
Oats.—Sunrise oats grow quicker and taller than the Algerian variety, and are by far the best under irrigation here. If sown on 1st April and treated with a couple of waterings, Sunrise oats will be knee high by the early part of June and fit for either grazing or soiling. Usually there is a heavy growth of trefoil through the oats, and the mixture makes a well-balanced fodder. They should be sown at about 40 lb. per acre and must be carefully watered. If too much water is used the germination is apt to be light and the stand thin. They may be grazed or cut green and then yield a good crop for silage or hay.

Wheat.—Quick-growing varieties of wheat may be sown, but the crop is usually much inferior to Sunrise oats or Skinless barley for green feed. From 50 to 60 lb. of seed, or even more, should be sown, for wheat has not the same stooling propensities as oats and barley. Sunset wheat is very rapid in its growth, being in head six weeks from the first watering. It appears to germinate more readily under irrigation than Florence, which seems to be unsuitable, as the least bit too much water destroys all the grain.

Japanese Millet.—Though this crop does not grow so high here as in the south, it is perhaps the best crop for the spring, summer, and autumn months, but it does no good sown in winter. The seed may be sown from September till April, and good feed will soon be available. The seed germinates well, even when broadcasted just prior to watering and without so much as being harrowed in. It is perfectly safe for stock and may be fed off continuously for months, and then if the paddock is shut up will produce a good cutting for hay or seed. It is only an annual, but it seeds profusely, and once sown it will be found appearing again and again in the paddock, self-sown crops at times giving a considerable quantity of feed.

Sudan Grass.—This useful summer and autumn crop should not be sown until late in the spring, but successive sowings can be made until March. It requires to be closely grazed to prevent the stalks from becoming too coarse, especially if it is intended to be cut for hay later. It makes

a hay of good quality, but it is more suitable for silage and for grazing. Isolated cases of Sudan grass poisoning have been reported, but the Department's experience suggests that in such cases the seed sown contained also seed of ordinary sorghum, which undoubtedly is poisonous at certain stages and requires more careful handling. Trials with Sudan grass have been going on here for the last four or five years, and not a single case of trouble has occurred. That it is very palatable to stock is the testimony of many; on this farm large stock were turned into a stand when it was up to 7 feet high, and they ate almost every plant down to the ground before looking for other feed.



Six Weeks' Growth of Sudan Grass on Black Soil.
An irrigated Crop at Coonamble Experiment Farm in the 1920 Season.

Sudan grass may be broadcasted at up to 16 lb. per acre or drilled in at 2 to 5 lb. per acre. With thin sowing the growth will be better and will last longer if water is scarce. Thick sowing produces very heavy growth for silage, but necessitates frequent waterings. The water may be applied by flooding to germinate the seed and the crop will grow in water.

Sorghum.—The sweet sorghums (which should not be confused with the grain sorghums referred to below) are usually poisonous while young, and should not be grazed. The crop is readily eaten by all classes of stock at any stage. It is usually sown in drills at about 3 lb. per acre, and, though it will stand flooding, it is best germinated by watering through furrows,

which allow of lateral soakage. Once established, the sorghums are very hardy; at times they may appear to be dead, but will rapidly throw out a fresh growth after moisture is made available.

Other Crops.

Maize can only be grown successfully for grain in years of good rainfall. In dry years the hot winds are too severe for proper fertilisation, and often only a few grains will set on each cob. With the very early varieties, such as Early Morn, Sundown, Wellingrove, &c., a fair setting of grain is possible if the seed is sown either very early in the spring or late in the summer.

The difficulty that attaches to the germination of maize with irrigation on the black soil has already been alluded to. If the seed is sown early a shower of rain will usually start growth, and then it may be watered without much trouble, but if it becomes necessary to irrigate the land in order to germinate the seed, it is essential that the water be sent down furrows that were made before the seed was sown. The seed should be sown between these furrows and then the water turned in carefully so that the ground shall not be flooded, but so that the water may soak from furrow to furrow, thus germinating the seed.

With the black soil cultivation becomes almost an impossibility, for while moist it is usually too sticky to work properly, and when dry too hard to work up. If possible it should be kept clean by cultivating, and the maize should be hilled to assist it to stand during subsequent waterings, for without hilling it often blows over quite easily after a watering and does not recover.

The chances of success with this crop in this district are really not good. Even if the cultural difficulties referred to are surmounted, galahs and cutworms attack the young plants at early stages, and crows levy a heavy toll upon the grain. In 1922 the risks were increased, promising yields of up to 45 bushels per acre being raided by mice in such numbers that they got the lot.

Grain Sorghums.—These chiefly consist of Feterita, Milo, and Kaoliang. The first-named is most promising for the local conditions, though Milo also has given good returns. Feterita has now been grown here for four years, and each year with success, the yields ranging up to 50 bushels per acre.

Sowing may be effected by drilling in either with the wheat drill or with the maize dropper, using the sorghum plate. The latter is the better method, as it sows more evenly and thinner, and it compacts the soil round the grain, which assists germination. A sowing of 3 lb. per acre in drills 3 to 4 feet apart is sufficient. As the crop is a summer one, it is usually necessary to water the land to aid germination. A little flooding over the surface does not do the harm in this case that it does with maize, but the water is best applied through furrows that were made either at the same time or before the seed was sown. The furrowing can be done with the wheat drill, by fitting furrowing feet into the hoes of the drill midway between the sowing drills.

The crop produces a splendid sample of grain here, suitable for feeding to horses, poultry, &c. In feeding value it is almost equal to maize, and it is readily eaten by all classes of stock. For several weeks in the autumn of 1923, fifty head of large stock, including the working horses, were fed on 7 acres of these stalks, and fattened quickly on them.

In harvesting the heads, the header may be used, if available; otherwise they must be cut by hand. Two men with secateurs and a waggon with sides on harvested an acre per day. The heads were threshed later on by being shovelled into the beaters of a harvester driven by an engine. The experience indicated that 100 bags per day could be threshed and bagged this way.

Broom Millet.—The blackest and richest land is the best for this crop for irrigation, though the lighter soils will produce fair crops in average years. The seed is sown in the spring and up till December, in drills 3 feet apart, and at the rate of 3 to 4 lb. per acre. Either the wheat drill or the maize dropper will serve the purpose, though the former implement is the one most usually used. Care must be taken not to sow too much seed per acre, or thinning will become necessary later on. Thick sowing produces too fine a hurl of fibre, while thin sowing results in too coarse a product. If it is necessary, thinning may be done by hand or by cross-harrowing soon after germinating.

The seed is very easily germinated by watering, flooding having little effect on it, and once it is above ground it will almost grow in water. Although the plants are hardy and are capable of waiting for rain or water for weeks prior to the commencement of heading, it will not stand much hardship once the head appears, or the broom portion will be stunted or perhaps fail to develop. At heading it should receive a good watering, and no further irrigation should be necessary until the heads are harvested. The crop grows quickly and seed sown in November can be harvested in March. The yield of seed ranges up to 15 bushels per acre, and of fibre to 10 cwt. per acre.

In harvesting the most successful method is that known as "tabling," which consists of bending the tops of two adjacent rows across each other, forming a bench or table. This can be done very rapidly at harvesting time, and the heads can then be cut off with greater ease and much faster. The crop as cut is placed on the "table," heads all one way, and is later tied into bundles. Harvesting is a slow operation, about four days per acre per man being good going. In case of rain the heads dry out again rapidly on the "table," and suffer far less damage than if they are placed on the ground to dry. In this district the crop dries very rapidly, of course, and may be carted into the shed two days after cutting.

Hackling (the removal of the seed from the fibre) may be done with a broom millet hackler, or by using the beaters of a harvester driven by an engine for the purpose. The harvester method is faster, for it allows four men to feed at once, and the seed is properly cleaned and boxed in one operation. When the fibre has been hackled it is only necessary to bale it up with a hay press and market it.

The crop residue is not usually considered high-class fodder, but during the drought of 1923 the stalks and dry leaves were readily eaten by the cows and sheep, and they improved in condition even when it was their only feed.

Cotton.—This crop was first tried in 1921-22, when about a tenth of an acre was sown. The season was a good one, and with a little bore water in addition to the rainfall, the crop throve well. It was sown late (in December), which was in favour of the plants as regards development, but they suffered severely from pests. This was confirmed in the following season, when an early-sown crop largely escaped the pests, but did not make such prolific growth as in the previous season. The germination the first year was too thick and hand-thinning had to be done. The following year the season was much drier and hotter, and a very thin stand was obtained—too thin, in fact, for a successful crop. It would appear that in a good season a fair staple can be produced here without resort to irrigation.

Rice.—Three varieties of rice were grown in the season 1923-4 with the bore water, and record yields for the State were harvested. Caloro variety yielded 165 bushels per acre. The trials are being continued this year on a larger scale to ascertain the commercial value of the crop under the conditions existing here.

General Conclusions.

The results obtained here show that irrigation with bore water is highly successful, and, apart from the production of crops for marketing, the carrying capacity of the land can be very much increased, and fat sheep and lambs can be put on the market almost any month of the year. The only obstacle is the limited supply of water available.

Suggestions for Harvesting Rusty Oat Crops.

The oat crops seem more affected with rust this season than the wheat, and before a farmer decides to cut a badly rusted crop for hay it would be well to go through it and locate the worst areas, leaving the best to be stripped for grain. This season at Cowra Experiment Farm it has been found that the heavy crop with an easterly aspect is comparatively free from rust, while the lighter growth facing the west is badly attacked. Where the growth has been checked or the crop is less vigorous on account of poorer soil the rust is often worst. In districts where threshing can be practised it might be well to cut the rusted crop for hay before it is quite ripe for grain. If not too badly rusted, the hay will be quite satisfactory and nutritious for use on the farm, though not presentable for market.

The present season affords a good opportunity to determine the rust-liable sorts, but we cannot afford to throw over a good variety because it is somewhat liable, as a rusty season seldom overtakes us. The worst offenders, however, must receive summary treatment. Such are Kelsall's, Calcutta, and Fulghum. One of the most rust-resistant of oats is White Tartarian. We are using this variety in crossing experiments, or its sister, Reid's New, with encouraging results.—J. T. Pridham, Plant Breeder.

Rice Growing.

A. N. SHEPHERD, H.D.A., Senior Agricultura Instructor.

THE two essentials for rice-growing may be said to be: (a) a soil with an impervious sub-soil, and (b) a plentiful supply of water.

As to the first of these essentials, it may be pointed out that rice is grown submerged (for a considerable time if not altogether) below 5 or 6 inches of water, and unless the soil is capable of retaining the water on the surface rice-growing is an impossibility. Apart from the quantity of water required to maintain the correct depth, allowing for seepage, any damage that may be done to surrounding country through such seepage has to be considered. The quantity of water required to cover and maintain a depth of 6 inches over a large area of country, taking into consideration losses by seepage, evaporation, and transpiration of the plants, is obviously large, so that plenty of water must be available.

As with other farm crops, early soil preparation is amply repaid, while in the absence of such preparation the cost of seeding is increased and yields diminished. More seed is required on a poorly prepared seed-bed, and even then the stand is not so satisfactory as when the land has been carefully prepared. It is usual to plough during the winter and follow with cultivation, which may be carried out with disc or springtooth implements, to reduce the land to a good tilth.

Grading and Making Check Banks.

If the land is uneven, having "bumps" or depressions on the surface, it must be graded to allow of even watering. Check banks are essential, being required to retain the water on the land. The direction of the check banks and their number is determined by the contour of the land; in other words, by the fall.

In America many rice lands are laid out according to the contours, the falls between the check banks being usually about 2 inches. By adopting this method of checking, it is claimed that fewer banks are necessary, and the watering is also less laborious, as the water is more easily controlled and can be readily led from one bay to the other, thus gradually refreshing the water.

The height and width of the check banks should be such as will hold the water on the bays. As it is usual to submerge the rice to a depth of 6 inches the banks should be at least 1 foot high when first erected, as they usually drop when the water is put on. It is advisable to make them 3 to 4 feet wide, for, in addition, to giving sufficient strength, this width also allows seeding and harvesting machinery to pass over them without injury being done to the machines.

In making the check banks, high furrows should first be thrown up with a plough—a disc for preference—and then the soil from each side should be crowded in to reinforce and make each bank of sufficient height. A special "crowder" made for the purpose is very suitable for doing this work, or if a road grader is available satisfactory work can also be done. An ordinary delver may also be made to serve the purpose.

Sowing.

It is usual to sow when all danger of frost is past and the water is becoming warmer. It should be the aim of the grower to sow as early as practicable, as this will allow of the growing of long season varieties, these being better yielders than the shorter season sorts.

On the Yanco Irrigation Areas it is usual to sow about the end of September or beginning of October, using seed at the rate of 90 to 110 lb. per acre, according to variety, preparation of the land, method of sowing, and number of rice crops taken off the land.

The late or long season varieties, being more profuse stoolers than the early maturing varieties, do not need to be sown with as much seed as the latter. The better the seed-bed the less seed is required, germination and subsequent growth both being better. If the seed be drilled less is required than if broadcasted; this specially refers to whether the seed be sown on dry land or on land already submerged.

The biggest pest that the rice-grower has to fight is the weed growth, and many methods have been adopted to overcome this trouble. It is much better to try to prevent weeds than to try to eradicate them from a rice plot. Good farming with fallowing tends to keep weeds down, and hand-pulling, especially along ditches and check banks, can be of great assistance. Where rice has been grown for a season or two, it is very noticeable that weeds become very bad unless preventive methods be adopted. When it is known that the land is infested with weed seeds, the practice of putting water on to the land so that it becomes covered, and then sowing the seed into the water, has been adopted. The rice then germinates and makes satisfactory growth through the water, but the weed seeds that ordinarily would grow are killed, and a clean crop thus results.

Another method is to sow the rice either broadcast or to drill it on top of the dry land and then inundate. In both these cases the water is kept on the crop until it has matured sufficiently to be taken off preparatory to harvesting.

In the case of locally grown rice, the method adopted to date is to sow the seed as if it were wheat or oats, the ordinary wheat drill being used and the seed being covered in the soil in the ordinary way. Immediately after seeding, the land is irrigated to assist germination, and this is usually followed

in about a week's time with a second application of water. The grower should keep a careful watch so that if necessary a watering may be given as the young plants begin to come through the soil, for if at this stage the land be allowed to cake or set hard on the surface an unsatisfactory stand may result, the young plants being unable to break through the hard surface.

The young plants are now irrigated in the usual way until about thirty days after emerging, when the water should be allowed to remain on the crop, gradually increasing until a depth of 6 inches is reached. This level should then be retained until time to drain off.

From trials on the Murrumbidgee Irrigation Areas it is found that it is not necessary to have a constant changing of water, but if renewal be frequently given to replace or bring the water to the necessary level—6 inches—satisfactory results follow. While this practice may hold good in this area, before it is adopted in other parts the composition of the water and of the soil should be considered, for harmful salts may be present in either.

It is usual to keep the water on the crop until the grain is in the dough stage and the panicles are well turned down. Care must be taken in draining off the water not to carry out that operation too quickly, but to extend it over a few days, as otherwise the plants are likely to fall, and much of the crop thus be lost.

Harvesting.

One may say that all machinery used in the harvesting of wheat may be similarly used with rice. In 1923, both the combined harvester and the reaper thresher gave very satisfactory results on the areas, while during the harvest of 1924 resort was made to the damp weather stripper, the grain being then cleaned with a winnower. On small areas the last machine is best, being smaller and lighter of draught, and therefore more easily handled, and with short lands and many turns the loss of grain is not so great as it would be with one of the larger machines, where the grain is taken from the machine ready for bagging. These latter machines require an even pace with a regular feed of crop to give the best results, and this is not available on a small plot.

The crop may also be cut with a binder and threshed. In such a case the crop is harvested earlier than if it is intended for stripping.

The rice, as taken from the machines, is known as "paddy," but at this stage the husk has not been removed. The hull usually varies from 15 to 20 per cent. by weight of the "paddy." Rice is imported into this country as what is known as "uncleaned rice," that is, "paddy" with the hull removed. In this state considerable shipping freight is saved over the "paddy" stage. After being received the rice is polished to produce the commercial article.

Most encouraging results have been obtained with three varieties obtained from America, namely, Caloro, Colusa, and Wataribune, although trials have also been made with several varieties obtained from Java and Queensland. In the case of the latter they were of the upland type, although grown in this test as swamp rice.

The American varieties are what are known as short-grained sorts, and are of very good quality. Colusa was obtained from Italy, having originally come from China. Caloro is a selection made from Early Wataribune in America, and Wataribune was originally a Japanese variety. They mature in this order at intervals approximating twelve days. As already stated, when a grower is selecting a variety for sowing he should aim at obtaining the longest maturing variety that his district will allow.

The value of rice fluctuates. The majority of the rice used in this country is imported from Burma; at present it is valued at from £12 to £14 per ton in the uncleaned but hulled stage. At this price there appear good prospects for the crop.

Yields of up to 119 bushels per acre have been obtained on the Yanco Irrigation Area from plots measuring 1 acre. In all an area of 4½ acres was sown to rice, the different varieties giving yields varying from 87 to 119 bushels per acre.

Reports show that at Coonamble Experiment Farm, where the crop was grown with the aid of bore water, computed yields up to 165 bushels per acre were obtained.

WHAT AMERICAN WHEAT COSTS TO PRODUCE.

THE Bureau of Agricultural Economics of the United States Department of Agriculture has issued some interesting figures on the cost of producing certain field crops in 1923. In the cost figures are included charges for labour of the farmer and his family, and a charge for the use of the land on a cash rental basis; so that if the cost just equalled the price, the farmer was paid for his time and his investment. The several items of cost per acre include preparation and planting, cultivation, harvesting, marketing, miscellaneous labour (including irrigation and water, spraying and spray material), fertiliser and manure, seed, land rent, and miscellaneous costs (sacks and twine, crop insurance, use of implements, use of storage buildings, and overhead).

A summary of 997 reports showed that the average gross cost of producing an acre of wheat amounted to 24·99 dollars (approximately £5 4s. 1½d.) in the western division in 1923. The credit for straw was 1·04 dollars (4s. 4d.) per acre, leaving an average net cost of 23·95 dollars (£4 19s. 9½d.) per acre and 1·09 dollars (4s. 6½d.) per bushel, the average yield being 22 bushels per acre. The average sales value per bushel was 87 cents (3s. 7½d.), and the value per acre was 4·56 dollars (19s.) less than the cost per acre.

This does not represent an actual cash loss; it does mean, however, that many farmers did not receive sufficient income from wheat to pay all cash expenses of production, and to allow them ruling wages for their time and the cash rental value of their land as reported.

Crops Suitable for Ensilage.

TRIAL AT CONDOBOLIN EXPERIMENT FARM.

F. MATTHEWS, H.D.A., Experimentalist, Condobolin Experiment Farm.

A TRIAL was conducted on this farm in the past winter with the object of determining the crop or crop mixture most suitable for ensilage in the district.

The following varieties were tried :—Cape barley, Sunrise oats, Algerian oats, Skinless barley, Clarendon wheat, Gresley wheat, and Slav rye.

The soil, a fairly typical one, is a red loam, with about 25 per cent. clay, which is inclined to run together after rain, and uneven, this portion of the paddock being reclaimed scalded country.

The paddock had been sown with wheat in 1922, the stubble grazed, and disc-ploughed to a depth of 5 inches in August, 1923. The area selected for the trial was springtoothed in January, and disc-cultivated in February, 1924. The rainfall during the fallow period was 735 points, and during the growing period 799 points.

On 16th April, 1924, the plots—one-thirtieth of an acre each—were sown in triplicate with a uniform application of 75 lb. superphosphate per acre.

Germination was fairly uniform, but the fallow being very dry little growth took place until June.

The plots of Slav rye were ahead of the others right through, growing to a height of 5 feet 9 inches, the crop being fairly succulent, standing well, and not coarse.

Sunrise oats made an excellent growth of thick, succulent material, free from disease.

Skinless and Cape barley provided a good bulk of silage. The former is more suited to local conditions as it headed out about ten days before the latter. The Cape barley was badly affected with loose smut.

Algerian oats, though yielding well this year, are usually too late for ensilage here.

The plots were harvested, weighed, and pitted on 23rd September. The palatability of the various fodders ensiled will be tested when the pit is opened.

Variety.	Seed per acre.	Average yield of three plots.	Variety.	Seed per acre.	Average yield of three plots.
	lb.	t. c. q. lb.		lb.	t. c. q. lb.
Cape barley ...	50	8 13 0 2	Gresley ...	66	6 7 3 26
Sunrise oats ...	50	7 8 0 12	Skinless barley ...	45	6 6 0 5
Slav rye ...	45	7 7 0 14	Clarendon ...	66	5 17 3 16
Algerian oats ...	50	6 16 1 22			

A plot of rape was also sown at the rate of 8 lb. per acre, but the droughty conditions in the early part of the year killed out most of the plants. Those surviving had made good growth by the end of August, which is too late for winter feed in this district. Generally speaking there is little rain here during February and March, which is the time rape should come away to be of use as winter feed.

Seed of field peas arrived too late for inclusion in the main trial, and was sown in small plots on 22nd April, in conjunction with Sunrise oats, Algerian oats, Gresley wheat, and Skinless barley, with the following results :—

Variety.	Superphosphate per acre.	Field Peas per acre.	Cereal per acre.	Yield.
	lb.	lb.	lb.	t. c. q. lb.
Algerian oats and Field peas ...	75	30	44	9 0 0 0
Sunrise oats and Field peas ...	75	30	44	6 8 2 8
Skinless barley and Field peas ...	75	30	45	6 5 1 13
Gresley and Field peas	75	30	66	6 2 2 0

The year was an excellent one for peas and fair growth was made. In an ordinary year it is questionable whether sufficient growth would be made to warrant planting.

Slav Rye.

Crop at Condobolin Experiment Farm, intended for silage.

Although the Cape barley plots yielded over 1 ton per acre more than the Sunrise oats, the value of oats as an aid to checking disease should not be lost sight of. This year flag smut is fairly prevalent in the district, and a three-course rotation of oats, fallow, and wheat appears to be the only way to check it.

The main object with ensilage crops in this district is to get the maximum bulk of silage in as short a period as possible. The crop should be sown about 15th March, and be ready to pit by 15th September, at latest. Otherwise hot drying winds in October cause considerable loss in weight.

This year, after a strong westerly wind with dust, plots cut on a certain day yielded on an average 10 per cent. per acre less than those cut the previous day.

Coonamble Experiment Farm.

Some Experiences with Conserved Fodder.

W. H. BROWN, Editor of Publications.

The primary object in the establishment of Coonamble Experiment Farm was the demonstration that the heavy black soil from which the Black Soil Plains of the north-west take their name, can be cultivated with advantage—not so much perhaps for grain—though the possibility of that class of crop proving profitable has never been lost sight of—as for the growth of fodder crops that will increase the stock-carrying capacity of the land.

It is by pasture improvement and by the growth of crops that will supply additional feed in periods of scarcity that the number of sheep in the State is going to be increased without a recurrence of the enormous losses of stock common in droughty periods in the past. The conditions around Coonamble are no doubt somewhat unique, and the methods by which improvements in the respect mentioned are actually to be accomplished are of somewhat local interest, but the very peculiarity of the conditions makes the success that has attended the Department's work there of the greater importance to farmers and graziers similarly circumstanced.

The problems involved in the handling of the black soil under irrigation conditions are dealt with in an article by the Manager, Mr. R. W. McDiarmid, which appears elsewhere in this issue, and it is not proposed to follow those details here, but the general experience of the farm in the production of fodder crops, for which the black soil is suited in quite a remarkable way, and of the way in which these have contributed to the success of the whole enterprise, is of considerable interest.

The Lighter Soils of the Farm.

The farm covers an area of 1,945 acres, of which about 1,400 acres are heavy black soil, and the balance chiefly a light red loam with a good sub-soil. The latter soil is representative of thousands of acres in the district, of which considerable areas have in the past ten years been cleared for wheat for grain, the Department's work in the production of varieties of wheat adapted for the widely varying conditions that obtain in New South Wales having made profitable cropping possible. This red soil has proved reasonably safe for grain, crops of a few bags per acre being harvested nearly every year where a full fallowing period is included in the preparation of the soil. On new land 17 bushels were obtained in one year from Hard Federation, a variety that has proved one of the best suited for the conditions. Occasional failures have no doubt to be expected in a district where the rainfall is apt at times to fall below 10 inches for the twelve months, but the results obtained on the farm prove that, subject to the adoption of proper methods and varieties,

such failures are far less frequent than might be supposed. In addition to Hard Federation, already mentioned, Florence, Clarendon, and Canberra have yielded consistently, and in the present season have borne a most promising appearance up to the time of writing.

For grazing purposes, the red soil in good seasons throws up considerable quantities of crowfoot and useful native grasses, and of saltbush of a nutritive quality. As we proceed it will be found that the combination of red and black soils, properly manipulated, makes for large carrying capacity and for security under a variety of conditions, and graziers who have both formations on their properties are more fortunate than many perhaps think.

The Black Soil.

The black soil—deep, heavy to work, sticky when wet, and drying out readily—produces a great abundance of vegetation when moisture is present (whether as a result of natural precipitation or of irrigation), and therefore offers excellent prospects for the production of fodder crops.

For grain it is apt to be disappointing. A yield of 31 bushels of Hard Federation was obtained in one season, but under droughty conditions the soil dries out rapidly and opens out in wide cracks that expose the subsoil to the influences of the sun and the wind, and at the same time so damage the roots of the plants as to cause their complete collapse in a few days. Many a crop has looked promising for grain on this heavy soil, and has absolutely perished in a few days when a hot wind has sprung up.

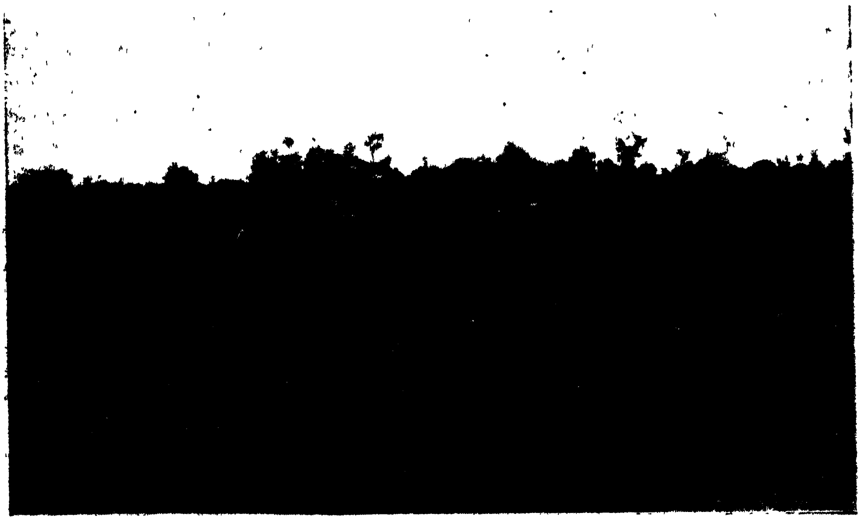
On the other hand, the black soil can be relied upon for heavy yields of vegetation suitable for hay or silage purposes, providing the conditions are anyway favourable. In the season in which 31 bushels of Hard Federation wheat was obtained, the yield of hay from the same variety was 4 tons—simple testimony to the possibilities of such country.

Quite apart from irrigation, a wonderful growth of herbage (chiefly trefoil) springs up after rain, and cultivated crops do correspondingly well. In 1920, for instance, following a flood in the Castlereagh which covered thousands of acres, it was estimated that the trefoil on the farm yielded green stuff suitable for silage at the rate of 7 tons per acre, small patches running even higher. About 25 acres were harvested, the yield being so heavy that the cost was only 4s. 2d. per ton in the pit. In the same season 80 acres of barley averaged 10 tons of silage per acre, the cost in the pit silo (including cultivation, sowing, and harvesting) barely exceeding 6s. per ton.

Nor are these yields altogether exceptional, for in 1921 (another good year) Cape barley again gave 10 tons of silage per acre; Skinless barley, 12 tons; Sunrise oats, 14½ tons; Algerian and Ruakura oats each 9 tons, and so forth. It is appropriate to remark that on the black soil Cape barley and Sunrise oats are both more reliable for grain than wheat. In the present season, Cape barley, which had been grazed by large stock late in the winter, has been made to yield profitable grain by being shut up and irrigated after being fed off.

Neglected Opportunities.

The foregoing returns, be it observed, have not been obtained by any artificial means. It is quite true that bore water is used on the farm for irrigation purposes, but the yields mentioned were obtained under ordinary farm conditions. The same opportunities for producing crops and for conserving them in the hay stack or the silo pit—the same opportunities for making use of natural herbage, are available to other farmers and graziers, of whom, unfortunately, 90 per cent. seem content to allow their profits to be governed more by the caprices of the weather than by their own energies. In the season 1921, when the whole district was covered with vegetation 3 feet high and more, thousands of tons of hay might have been saved and



Cutting Hard Federation Wheat for Hay.
A non-irrigated crop on red soil at Coonamble Experiment Farm. Yield—2 tons per acre.

stored for future use, yet hardly a stack was to be seen anywhere. Thousands of tons, too, might at small outlay have been cut and carted into silo pits, but the number of men who utilised the opportunity was negligible. Instead, nature's profusion was allowed to die off, and the biggest portion of it to be trodden into the dust or blown away.

Is it any wonder that the Department's advice to such men should seem to be limited to well-worn phrases? No magician's wand is in the hands of the experts; no royal road to wealth can be pointed out. The pathway to success, as ever, lies in the direction of the simple acceptance of opportunity, and in this favoured district opportunity is frequent and lavish.

It was urged by some pastoralists in 1921 that the burr trefoil that covered the land (especially the black soil) was of indifferent value as fodder, but Mr. McDiarmid, Manager of the farm, obtained a sample at the proper stage

(with the burr in it) and sent it to the Department's chemist for analysis. Mr. Ramsay's reply compared the trefoil (or clover) hay with an ordinary sample of lucerne and with a sample of lucerne hay in the following table, the figures being presented on a moisture-free basis:—

	Clover Fodder.	Lucerne.	Lucerne Hay.
Ash	8·70	9·9	9·3
Ether Extract	3·69	4·5	3·8
Fibre	26·67	25·3	32·00
Albuminoids	25·00	19·8	15·9
Carbohydrates	35·94	40·5	39·0
Nutritive value	69·2	70·4	65·7
Albuminoid ratio	1 to 1·7	1 to 2·6	1 to 3·1

The report concluded: "Compared with lucerne hay the clover fodder contains relatively less ash and fat, while the albuminoids are much greater, with the result that the albuminoid ratio is narrower, while the nutritive values are about the same."

Manifestly, to allow fodder of such quality to go to waste was to neglect material of distinct value. On the experiment farm it turned to wealth in a way hardly expected at the time it was saved, as we may proceed to detail.

What Conserved Fodder and Irrigation made Possible in 1923.

What the north-west is capable of in a fair season, and what conserved fodder is worth could hardly find better illustration than on this farm in the year 1923. In the early part of that year the farm was carrying nearly 800 flock sheep on saltbush, which had come away abundantly on the red soil following nice December rains. On one of several 30-acre paddocks of black soil that have been graded and adapted to irrigation, some eighty-six special ewes, and a few lambs were grazed all the year, and there were on the farm the usual large stock, say, thirty horses and twenty head of cattle.

Further west things were so dry that Nyngan Experiment Farm was short of feed and water, and in February 1,600 sheep were railed to Coonamble, where they also were grazed on the saltbush. This feed, which was of excellent quality, lasted well into May, when it became necessary to supplement it, and 1½ to 2 lb. per day of silage (the silage that had been conserved in view of such an emergency) was fed daily with about 1 lb. of Sudan grass hay. The hay ran out in the middle of June, and 1 lb. of lucerne hay was supplied instead. This was continued until 16th July, when the sheep were returned to Nyngan. They had got somewhat low in condition when the hand-feeding was commenced, but they soon improved on the silage and hay. The economy of this feeding as compared with purchased fodder can be gathered when it is recorded that, including the silage at 7s. 6d. per ton and hay at 30s. per ton, and allowing the wages of one man at 13s. 2d. per day, it only cost £2 5s. per day to feed 1,600 sheep. How far that sum would have gone in the way of purchased fodder, with hay approximately £10 per ton and licks £15 per ton, it is not hard to imagine.

Meantime Trangie Experiment Farm had also been feeling the effects of the dry autumn, and 340 young rams, which it was essential should be kept in unchecked growth, were also received at Coonamble on agistment. These rams were placed on saltbush, and were allowed to graze daily over 32 acres of Japanese millet, and another 38 acres of Sunrise oats, both of which crops were on irrigated black soil paddocks.

That a farm of 2,000 acres (an appreciable part of which was under crop and fallow) should thus have carried equal to 3,000 sheep for several months in drought time is surely remarkable. The secret lay partly, of course, in the December rains, which brought away the saltbush on the lighter country, but partly also in the abundance of feed yielded by the

Stacking Hard Federation Hay.
Not irrigated; black soil; season 1920. Yield—4 tons per acre

irrigated black soil, and in the silage, obtained (as already related), from non-irrigated land in a period of abundance. The immense value of the resources that lie at their hands should impress graziers on the Castlereagh and, indeed, throughout the central and northern west.

A 1924 Experience.

One other circumstance pointing in the same direction may engage the reader for a moment. One central paddock on the farm has been subdivided into three sections of 32 to 38 acres each. They have been properly laid out for irrigation purposes, being graded and provided with head ditches, drainage channels, and check banks. These three small irrigable areas have proved of immense value at different times, affording amazing quantities of feed and of fodder for storage. On one of them were grazed in 1923 the

eighty-six stud ewes referred to above, and another supplied the Trangie rams with the grazing on Japanese millet in the same season. They perhaps never did better than in early spring of this year, when portion of one of them (14 acres) maintained 840 sheep for a month, and the balance of the same small paddock could have kept them for weeks longer.

The whole 30 acres in the early spring was carrying a heavy growth of self-sown Sunrise oats, and of grasses and trefoil. Following the previous year's crop of Sunrise oats (harvested for grain), the paddock was irrigated about Easter, 1924, and had made a good growth. The dry weather of the early winter necessitated a further watering in June, which brought away such an abundance of feed that (other paddocks being somewhat bare) it was decided to turn the sheep in for a couple of hours daily. A light fence was run across the paddock with the object of admitting the sheep only to a small section at a time, and this was shifted back as each section was cleaned up. At the end of the month rain came, and the grass in the other paddocks improved. There remained untouched on the irrigation paddock, however, nearly 24 acres of even heavier growth, and this it was decided should be conserved as hay for the large stock on the farm. The long stuff and the short could not be cut together, and the reaper and binder had first to be used to cut the oats, and then the mower to cut the lucerne and trefoil. Mr. McDiarmid anticipated half a ton of oaten hay per acre, and quite a ton of cured trefoil, lucerne, and grass hay. How long the whole 38 acres would have carried the 840 sheep can only be estimated, but it would surely have been several weeks more—a remarkable growth, indeed, when it is remembered that the seed was self-sown and the ground merely irrigated twice without any working.

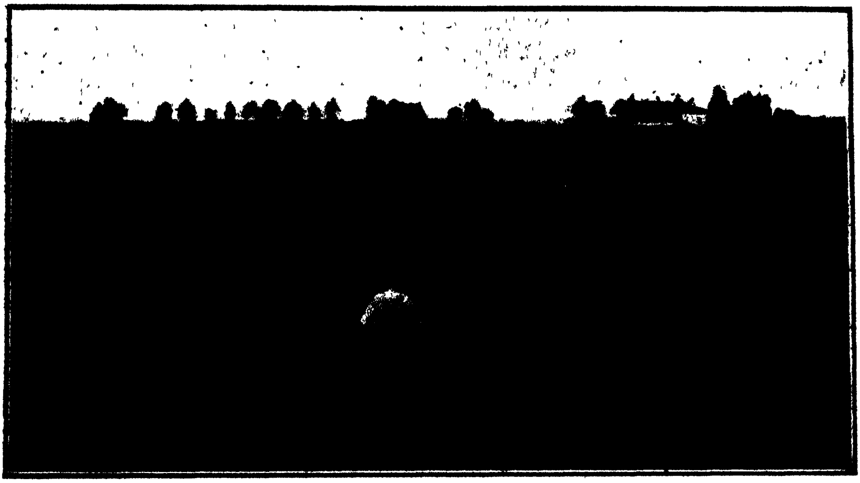
The Subdivision and Watering of the Farm.

The foregoing account of the crops that have been obtained and the use that has been made of them indicates the possibilities of the district, but there are other features of Coonamble Experiment Farm that offer suggestions to farmers and graziers on similar country. In the thirteen years of the farm's history the property has been subdivided into over twenty paddocks, the largest of which is now only 240 acres in extent. This subdivision has had a marked effect on the carrying capacity of the property. At the outset it was considered to be well stocked with some 750 sheep, but to-day it would carry twice that number, and would keep them in better condition. It is, however, a mistake to overstock, and the flocks usually do not greatly exceed 1,000.

Water has been ensured by the excavation of two or three tanks, some of which can be supplied, if necessary, from the bore. This valuable improvement was completed early in the history of the farm, and though the flow is not quite so large as at the outset, the indications are that it has now become fairly well stabilised at 370,000 gallons per day. The farm is in the fortunate position of being able to use a substantial amount of bore

water for the irrigation of the crops. In this respect it is not singular, of course, for there are a good many properties in the district with their own bores—some with three or four—but the bores put down in more recent years are under the supervision of the Water Conservation and Irrigation Commission, and the use of the water is limited to domestic and livestock purposes. It might be supposed that this reservation would awaken owners of bores not so affected to the immense value of their resources, but very few of those who have bore water available make any attempt to take advantage of the opportunities at their hands for the growth of fodder.

The prejudice against bore water on the ground that it ultimately spoils the land is one reason, perhaps, but experience on the farm, where irrigation from the bore has been going on for ten years, does not support the notion.



Excavating a Silage Pit at Coonamble Experiment Farm.

It may be that the water is not so strongly alkaline after it has been flowing for a time as at first, though the analysis made in 1916 certainly showed a fairly considerable amount of deleterious salts. Experience, however, indicates that providing rotation is practised, and the same paddock is not required to raise irrigated crops year after year, fertility is not in any way affected.

Bore Water Irrigation as Some Practise It.

The methods of irrigation adopted by some farmers in the districts, who claim to have tried it, have been anything but propitious. In some cases it has consisted of simply running the water on to the land, with little idea as to quantity and no provision for drainage. Naturally the crops refuse to grow in a bog, and irrigation is condemned in consequence. On the experiment farm proper methods have been adopted, the supply of water being carefully regulated, and drainage ensured. The making of head ditches,

drainage channels, and check banks, and the use of the smoother are described in Mr. McDiarmid's article, but here let it be affirmed emphatically that they are as essential under bore water conditions as on the Murrumbidgee Irrigation Areas. Encouraged by the results obtained, the area adapted to irrigation on Coonamble Experiment Farm is being steadily extended year by year, and the farm is as steadily increasing in value by reason of its enhanced carrying capacity, and its greater security.

The bore water has been conducted through the grazing paddocks by open channels, and in the centre of the farm a windmill lifts what is required for the yards, stables, dwellings and home paddocks into overhead tanks, into which it is reticulated in all directions.

The Sheep on the Farm.

A small stud of Merinos is located at this farm. It was founded in 1919, when 500 stud ewes were obtained from the well-known Koonoona stud in South Australia. These have been joined to rams of the Wanganella type, bred at Trangie Experiment Farm, the object being the production of characters a good deal resembling those described in this *Gazette* in connection with Trangie last month. Some eighty special ewes have been put aside, and are run in one of the above-mentioned 10-acre irrigable paddocks, so that they may have the best of conditions.

The Koonoona stud sheep are noted for their large frames and for being "hard doers." Their wool is rather strong, but the Trangie rams have already fined that down in a measure, and a type more suited to central-western conditions is being produced.

The average clip over the whole of the sheep on the farm this year was 12½ lb., some ewes in the stud cutting up to 18 lb. It has been observed that the tendency is for the ewes to put on condition to such an extent that the lambing percentage is low, and it is necessary, therefore, to superintend their grazing with some care.

The Making and Filling of Silage Pits.

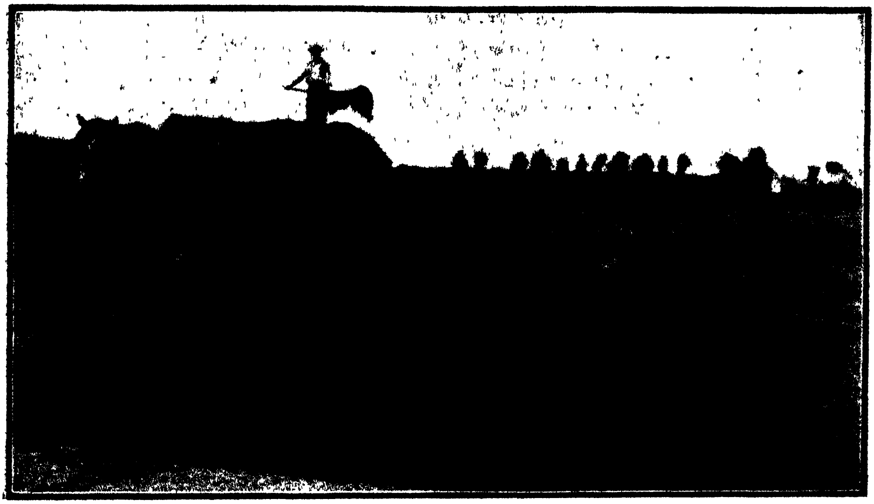
It will be gathered that the use of silage on this farm has been attended with a good deal of success, and a few further details may be offered regarding the crops used for the purpose, the methods of conserving the fodder, and the supply of it to the stock.

It is a prime consideration that crops suitable for storage in pit silos can be raised so inexpensively. The springtooth cultivator is quite heavy enough to prepare the black soil for the seed—indeed it is better than the plough—as Mr. McDiarmid remarks in his article, because the black soil invariably dries out to the depth of the working, leaving a loose mass of dry crumbs on the surface. To plough 4 or 4½ inches deep and afterwards sow seed 2 to 3 inches deep, is literally to plant the seed in a dry bed, in which it must await rain to germinate it. On the other hand, if the soil is only worked 2 or 3 inches deep it is sometimes possible to put seed down on the undisturbed damp soil, and thus to ensure an early germination. Prepared in this way

the black soil can be sown for 10s. per acre, and with yields running up to 15 tons per acre, the cost of the stuff in the silo is only about 5s. per ton. If the land is ploughed the cost is increased to about 6s. 3d. per ton.

In 1920 something like 1,000 tons of silage was put down, at a total cost of £211, or 4s. 2d. per ton. The horse value was not included in these figures, as feed was so plentiful that no hand-feeding had to be done, but two teams that were hired to assist with the carting were included in the outlay. The wages paid the men were at the rate of 12s. 10d. per day.

In 1921, the cost of cutting and pitting about 20 acres of wheat and barley amounted to £38 18s. 5d. for wages only, which equals 4s. 2d. per ton. The cost of covering the pit in after it was full amounted to £2 16s. 8d. Allowing



Filling a Silage Pit.
In the later stages the load is drawn into the pit.

for the planting and sowing of the 20 acres, the total cost of the silage was 8s. per ton, the increase in price as compared with the previous year being due to the difference in the distance of the paddock from the pit—a sufficient indication that the pit should be as near the crop as possible.

The pit system will ultimately be the only one considered in the western districts, and it is important that the pits be excavated cheaply and yet efficiently. In general, the larger the pit the less the waste and the better the article produced. Nothing less than 100-ton pits should be excavated, and the capacity can be estimated on the basis of 2 cubic yards per ton of silage. While it is well to make the pit fairly deep in order to ensure consolidation, the excavation becomes costly if the depth is too great. On one or two of the Department's farms depths of up to 8 or 9 feet are preferred by the managers, while on others 6 feet is considered deep enough. Mr. McDiarmid favours the latter. Plough and scoop are the only implements

required. The plough should be worked along the length of the pit, and as long as possible the scoop across it; after that the earth will have to be drawn out at the sloping ends. The work can be done so as to preserve a straight side; it may be found necessary to pick the sides down to get them vertical, but by good plough and scoop work it should be possible to avoid this operation. The excavation of pits with the farm labour and horses has cost only 6d. per cubic yard, and in one case a pit of 360 cubic yards capacity was excavated at a cost of only £7 7s. for wages.

In filling the first few loads of material may have to be thrown in from the sides if the batters at the ends are made a bit steep, but when the loads can be pulled through it will be found untied material like trefoil can be unloaded easily by pulling it off with ropes. Consolidation of the material is essential, and if it has been bound in sheaves, these should all be laid one way, in order to make close packing possible, and to facilitate removal later on. It is not essential to cut the bands, though some prefer to do so—in fact, it is rather an advantage in removing the fodder if the bands are uncut. Herbage like trefoil and crowfoot must be cut with the mower and raked up, but it becomes so tangled that it is rather difficult to handle. However, it makes inexpensive and nutritious fodder, and should not be wasted if that is avoidable.

No less than nine pits have been excavated on this farm. Only part of one was used in 1923, and others are still there, with their feed unaffected in quality, and in no danger from fire or anything else. When they may be needed, who knows, but that they may be needed some day is beyond denial, and meantime the abundance of the present season is being used to refill some of the empty pits.

The directions in which the varied activities of this farm offer advice and suggestion to farmers and graziers in the north-west are numerous indeed, but in no direction are they more important than in relation to the conservation of fodder. How much the adoption of the Department's policy would put in the pockets of graziers is beyond calculation, but we have at least presented a few facts that indicate how inexpensively and how easily the advice could be adopted, and with what substantial profits, even on a small scale.

Deleterious Effect of Muriate of Potash on Maize.

Fertiliser experiments with maize at Grafton Experiment Farm have shown muriate of potash to be a very unsatisfactory fertiliser for this crop. This is not to say that potash fertilisers are proved to be useless for maize, but that in the muriate form as obtained during the past few years the effect on the germination of the seed has been so deleterious as to offset any possible value it may have. Apparently some very acid principle in the fertiliser has been responsible for this, and in fact, was so strong as always to rot the bags in which the fertiliser was contained.—H. Wenholz, Special Agricultural Instructor.

Necrotic Enteritis of Pigs.

W. L. HINDMARSH, M.R.C.V.S., B.V.Sc.

NECROTIC enteritis is a name applied to an infectious disease which is causing some considerable loss in the pigs of this State. The disease is one which affects the inner surfaces of the bowels and sometimes the stomach, causing the lining membrane to become congested, thickened, and covered with dirty brown coloured masses of dead tissue. Sometimes but few of these areas are present, raised up in roughly rounded masses with well-defined margins. At other times larger areas are involved by extension of the smaller lesions until a great part of the bowel shows the presence of the scab-like masses of dead tissue. Young pigs up to the porker stage are more frequently affected than are aged animals, but the disease may attack pigs of any age and any class.

It is usually assumed that the disease is due to infection with the bacillus of necrosis, but many investigators now state that this germ, although often implicated, is not the primary cause. Numerous other germs have been found associated with the condition. Most of these are commonly found in intestinal contents and in dung. Hence, the proper sanitation of the piggery plays an important part in the control of the disease.

Symptoms depend largely on the extent and virulence of the infection, the age of the pigs, and their condition. The symptoms do not always give an indication of the extent of the lesions, since often a fat pig may show a large area of affected bowel, while in other cases a pig obviously ill and in poor condition may show comparatively few necrotic areas when examined after death.

As with most pig diseases, the first sign of illness is that the sick pigs are not inclined to eat, and lie about in a sheltered spot away from other animals. At times they may make their way to the feed trough, but do not eat much and turn away to lie down again.

Within a few days it is noticed that diarrhoea has set in, the pigs passing a semi-fluid dung at frequent intervals. Owing to the capricious appetite and the constant weakening effect of the diarrhoea, the pigs soon look unthrifty, the coat is dry, and the back is arched. The animals eventually die in an emaciated condition. At times some recover and put on condition, but a young pig that has been affected generally remains stunted in growth. Some animals die within a week of the first symptoms noticed, others may be sick for some weeks before death.

The disease when it first appears in a piggery is not diagnosed until post-mortem examination is made of one or more animals, when the necrotic changes referred to earlier in this article will be found.

Treatment cannot be considered satisfactory in this country, since the pigs when recovered have received such a set back in their growth that they can only be raised at an economic loss.

Prevention and control.—The disease usually occurs in piggeries kept under bad hygienic conditions, where the pig yards and pens are insanitary and dirty, and the yards small, overcrowded, and filthy.

(*a*) All animals dead of the disease should be burned.

(*b*) All sick pigs should be isolated at once. If seriously affected they should be killed and burned.

(*c*) If it is desired to try to fatten apparently recovered pigs, they should be kept in isolation and sold only for slaughter.

(*d*) Pigs in contact with diseased animals should not be allowed to mix with known healthy pigs for at least three weeks after contact with the diseased animals.

(*e*) All pigs newly received on the farm should be kept in isolation for at least three weeks before being placed with other pigs.

(*f*) All sties and pens which have housed sick pigs should be thoroughly disinfected. If not of solid construction they should be burnt where they stand. The yards should be ploughed or dug up, limed, and a green crop sown. Where the sties are well built and too good to be destroyed by fire, they should be thoroughly disinfected by scorching all over with a brazing lamp or thoroughly washed with a 5 per cent. solution of disinfectant. Floors should be scalded with boiling water and treated with quick lime. Wooden feeding troughs should be burned. Concrete and iron troughs should be well disinfected with a 2 per cent. solution of washing soda in boiling water. All litter should be raked up and burned.

(*g*) Where practicable a new piggery should be erected on a fresh site, and care taken that only healthy pigs are introduced.

(*h*) Being scheduled under the Stock Diseases Act, the occurrence of this disease in a piggery must be reported to the local Inspector of Stock.

American Progress in Eradication of Tuberculosis.

That as many as thirty States will be entirely free from tubercular cattle within the next eight years is the prediction of the United States Department of Agriculture, which reports encouraging results in the eradication of this plague. During the year ending 30th June, 1924, the accredited herds in the country have increased from 28,526 to 48,273, and more than 5,000,000 cattle have been tested. About 3½ per cent. of all the cattle in the country are still tubercular, although certain areas are already entirely free from the disease. With the cleaning up of larger areas the veterinary forces can be concentrated on the States where the infection is greatest, and it is but a matter of time, apparently, until cattle tuberculosis will be practically a thing of the past.

Common Feeding Stuffs used for Live Stock in New South Wales.

H. G. BELSCHNER, B.V.Sc., H.D.A., Government Veterinary Surgeon.

INQUIRIES are frequently received as to the relative value of different feeding stuffs for farm animals. The following is a brief discussion of the merits of the more common feeds used in this State and how they may be fed with advantage to animals on the farm.

Chaff.

Chaffed hay, either wheaten or oaten, is the chief feed used for horses in this State. The feeding value of chaff varies a good deal, and depends largely on the class of soil on which it is grown. A rich soil generally produces a chaff of high feeding value, although it may not have such an attractive appearance as chaff from lighter soils. It has been shown that chaff from hay grown on rich black soil requires to have very little grain added to make it a sufficient ration for horses. The time at which the crop is cut for hay also affects the nutritive value. The best time to cut wheat for hay is a few days after it is in flower, but oats should not be cut for hay until the upper tips of the heads turn white and the grain is fully formed, but still soft. The presence of grain in oaten chaff is desired, and the chaff should be a purplish green colour. Certain varieties of wheat and oats produce better hay than others, and so varieties are selected which yield straw and flag of good quality and colour. Of the wheats, Zealand and Firbank produce excellent hay; of oat varieties, Algerian is the best to grow for hay.

Chaff is much more economical to feed to horses than hay, and it prevents the waste which occurs through horses pulling long hay out of the racks and soiling it underfoot. For working horses, grain, such as oats or maize, is added to the chaff to make a correct ration, the amount depending upon the type of animal and the class of work he is doing. In horses of the light breeds that are used for pleasure or racing, the qualities desired are spirit, action, and endurance, and large paunchy stomachs are objectionable. Such horses require proportionately more grain and less chaff than horses doing slow or heavy work. Here again the class of grain is determined. Oats easily rank first among the grains for light horses, and they may be supplemented with crushed or soaked barley and bran. Maize may be fed to draught horses with advantage, but it is too fattening to constitute the bulk of the concentrates for light horses It may be used, however, if supplemented with linseed meal or bran.

Long hay is frequently fed to horses at night.

Following are examples of average daily rations for horses as used in this State, the exact quantity depending largely on the individuality of each horse :—

Draught Horse (Working)—	lb.
Chaff (wheaten) ...	18
Crushed maize (or oats) ...	9
Bran ...	3

Instead of the bran 4 to 5 lb. of chaffed lucerne hay may be used No grain should be given on Saturday evenings or Sundays. The ration may be narrowed by increasing the proportion of oats and to some measure by admixture of lucerne in the feed.

Light Horses (Active Work)—	lb.
Chaff (wheaten) ...	11
Oats ...	9
Bran ...	1

In addition, 3 to 5 lb. of hay should be fed at night.

Less concentrated feed is needed when oaten chaff is used, owing to the amount of grain in the chaff.

Chaff is also frequently used as a feed for dairy cows, concentrates in the form of crushed oats, linseed meals, bran and pollard, &c., being added. The following is a suitable daily ration for a dairy cow in milk, if fair grazing is also available :—

	lb.
Chaff ...	10
Crushed oats ...	3½
Bran ...	2½
Pollard ...	1
Linseed cake ...	1

Chaff is sometimes fed to sheep in drought periods in long narrow troughs improvised out of sacking. It is fed in conjunction with scrub feeding.

During the six years ended 30th June, 1923, New South Wales exported 23,140 cwt. of chaff to other countries and imported 8,140 cwt. From these figures it will be seen that the State produces sufficient hay for home requirements and has a surplus for export. In no year did the imports exceed the exports.

Wheaten Straw.

Wheaten straw is sometimes fed to horses as a roughage. It is bulky, innutritious, and not especially suitable, since the horse has a comparatively small stomach and its digestive anatomy is not designed for the disposal of

a large amount of bulky feed. So very little nourishment is derived from straw that it is not considered a satisfactory feed for animals doing hard work. Straw is carbonaceous and its principal use is for idle horses. Some laxative food should be fed in conjunction with it, and in this case the concentrate ration should be high in protein. Straw is frequently fed to working bullocks in this State in conjunction with natural pasture, and straw to which molasses has been added is often used to keep sheep and cattle alive during periods of drought. The economy of feeding straw is a factor which cannot be disregarded, but the practice should not be carried to the extreme and care should be taken to supply sufficient protein through the concentrate ration. This State produces more than sufficient straw for all requirements. There is a great wastage of straw, our chief method of harvesting the grain (by means of the "combined harvester" and "header"), leaving the straw standing in the paddock. A firestick is usually placed in the field of straw to prepare the paddock for the next ploughing. If a greater quantity of this straw were cut and stacked it would form a great standby in time of drought.

Wheat.

Wheat is not regarded as a suitable food for horses, and is not widely used in this country. If eaten by horses unaccustomed to it, it is liable to cause digestive troubles and laminitis. Wheat can, however, be fed to horses without causing ill effects if they are brought on to it gradually. Part of the prejudice is due to want of experience in its use. To be properly utilised it should be mixed with other grains, such as maize and oats. As much as 7 lb. of wheat may be given daily, but smaller amounts should be given at first. It should be clean and free from mould and is best fed whole.

The question of cost is also a factor owing to the value of the commodity as a food for ourselves.

Damaged wheat is often boiled and fed to pigs, and whole wheat is largely used as poultry feed.

Barley.

Most of the barley produced in this State is used for malting purposes, and except when its quality is below the maltster's standard its price prohibits its use as a stock food. As a grain it has come more into favour of latter years. Professor Henry, of America, says that "barley lies between oats and maize in protein and carbohydrates and has less oil than either."

When the horse's teeth are good and the labour not severe, barley may be fed to this animal whole. The grain is probably better rolled before being fed, but if finely ground is brought by the saliva into a pasty mass. Where maize and oats are not procurable, barley is largely used for horse feed: 4 lb. per day fed whole with chaff gives good results. It may also be scalded or

boiled, when 6 lb. of the soaked grain is fed. A daily ration for horses in full work is—

Chaff	20 to 30 lb.
Barley	4 lb. dry or 6 lb. soaked.

Twice a week bran should be given at the rate of 4 lb. per horse.

Barley may be profitably employed as a feed for milk cows and pigs. A good food ration for cows is—

	lb.
Barley Meal	10
Molasses	3
Hay...	20

Barley must be ground into meal or boiled to make it wholesome feed for pigs. The operation of boiling must be continued for at least twelve hours, the grain being allowed to simmer to a pulp, and care taken to prevent burning by adherence of the grain to the side of the heater.

Barley has a reputation for the production of high-class bacon. As barley is carbonaceous in character and is also not especially palatable to pigs, it should never be fed alone, but with palatable protein-rich foods. Barley is also valuable as a poultry food.

The food value of this grain for various classes of stock is not properly recognised here, though it is popular as a green fodder crop. It is at present produced only on a moderate scale although there are several districts where soil and other conditions are suitable, particularly with regard to the malting varieties. Now that malting operations are being undertaken everywhere on a larger scale a heavy increase in acreage may be expected. At present there is still a shortage in local supplies for malting purposes.

Oats.

Oats ranks as one of the best grains for horses. It combines all the elements necessary for nutrition in such proportions that the animal is able to consume a large amount without upsetting the digestion, and to extract the greatest possible amount of nourishment from it. Oats have been found to be the finest feed for horses of speed. Horses are very fond of this feed and will eat it in preference to all other grain. It probably comes nearer the requirements of a concentrate for horses than any other single grain. The kernel is encased in a hull, which adds to its value as a horse feed.

Oats are rich in muscle-forming food and possess moderate heating power. Compared with maize, they have more protein and less carbohydrates. They may be fed whole or crushed. It is not advisable to feed new oats or oats that are musty or mouldy. They are usually fed with chaff at a rate up to 10 lb. a day. For rations see matter on chaff.

Oats may form the entire grain ration for horses. The substitution of 2 or 3 lb. of wheat-bran improves the daily ration, provided it does not produce a too laxative effect. The use of wheat-bran with oats also lessens the tendency towards choking.

Digestibility of Oats (Horses).

Albuminoids.	Carbohydrates.	Fat.	Fibre.
85	78	80	26

Ground with meal and made into gruel, oats form one of the best foods for young stock. Crushed oats are very useful for foals at weaning time; 2 to 3 lb. may be fed daily up to 1 year old, and 4 to 5 lb. up to 2 years old, when running on good pasture.

It is important to note that the albuminoid matter of oats is identical with the casein of milk and cheese. This fact makes oats a valuable feed for milk cows, being equal to bran for them. For a ration combining crushed oats with chaff and bran, &c., see matter on chaff.

Oats are not fed largely to pigs, the reason being obvious if pigs are being fattened rapidly for market, but for breeding stock and stock not being attened they are a useful feed.

Crushed oats are fed in this country to working stud rams at the rate of ½ lb. a day, but are not fed generally to flock sheep.

During the last six years New South Wales imported 286,778 centals of oats, chiefly from New Zealand, and exported 229,116 centals to Fiji, New Zealand, Philippine Islands, New Caledonia, Straits Settlements, New Guinea, and Belgium. The imports therefore exceeded the exports by 57,662 centals. Bad seasons were chiefly responsible for this. In a good season the State produces sufficient oats for home requirements and is able to export. For example, in 1920–21 196,077 centals of oats were exported from New South Wales, whereas only 799 centals were imported from New Zealand, for special purposes only.

In the feeding of horses in Australia generally the plan of giving the food nearest at hand is largely adopted, with the result that maize is fed more than oats to horses throughout New South Wales. Actually oats cost less weight for weight than maize.

Maize.

Maize is one of the most valuable of grain foods and is estimated as the best fattening food known for all kinds of stock used for human consumption. On account of its fattening and heating qualities it is not suitable for feeding alone to horses, but in conjunction with another food, such as oats, bran, dried grains, &c., is highly valuable and easily digested. Maize is very largely used in this State as the chief grain for horses, largely because it can

be more easily obtained than oats and is often grown on the farm. It is fed on the cob, or shelled or ground. When shelled or ground it is usually fed with chaff and bran.

Maize is rich in carbohydrates and more energy is derived from 1 lb. of maize than any other suitable grain. It is considered an economical part of a ration. Since maize is low in protein, to be correctly used lucerne hay or other leguminous hay should be fed with it. In the absence of legumes a little oil meal or other protein concentrate may be included in the ration. Horses that have not been accustomed to maize should not be put on to it suddenly. It may form the major part of the grain ration for horses if a nitrogenous (protein) roughage is fed or some protein concentrate added to the ration.

For rations of chaff and maize, &c., see matter on chaff.

Digestibility of Maize (Horses).

Albuminoids.	Carbohydrates.	Fat.	Fibre.
78	90	80	55

Maize meal is sometimes fed as part of the ration for milking cows in conjunction with hay or chaff. Bran is usually fed in this ration to increase the protein and to counteract the constipating effect of the maize meal. Maize meal is also sometimes added to skim milk as a calf food.

Maize is largely used as a feed for pigs, particularly in the coastal districts, and is generally fed in the husk. There is very little advantage in grinding it for pigs. It is fed in conjunction with skim milk, which forms a well-balanced ration.

As a feed for sheep in times of drought maize has proved very useful in this State, providing some roughage in the form of lucerne hay, silage, or natural scrub is available. About 6 ounces per sheep is fed daily scattered on the hard ground.

During the last six years New South Wales has imported 834,383 centals o maize, chiefly from South Africa, New Caledonia, New Hebrides, Fiji, and New Zealand, and has exported 123,406 centals to various countries, chiefly New Zealand, Fiji, the United States, and Papua. The imports therefore exceed the exports by 710,977 centals.

Considerably more maize could be grown on the coast and along the coastal rivers of the State. Much valuable land suitable for maize growing is not utilised for this purpose.

Beans, Cowpeas, &c.

Beans, cowpeas, &c., are similar products of leguminous plants, and closely approach each other in feeding value and characteristics, peas being slightly binding in the form of meal and beans a little more so, hence they must be fed with foods of a counteracting nature. Both are eminently suited because

of their richness in albuminoid matter for use in limited amounts in the horse ration. Being hard seeds, such products should always be ground. Their proper use in a ration for horses is as a somewhat concentrated protein feed, to be combined with feeds high in carbohydrates, such as molasses and maize. Digestive troubles are very liable to occur if one or more of these feeds exceeds one-third of the concentrate ration.

These products are not extensively used in New South Wales as stock food, although their analysis shows them to be twice as nutritious as maize or oats. It is largely because their valuable qualities are not known that they do not form an important dietary of working horses in this State. A good mixture is composed of 8 bushels peas, 8 bushels maize, and 1 bushel whole linseed, all ground up together and fed with chaff in the same proportions as good oats. They can also be given with oil-cake, bran, or similar food for fattening stock. For sheep and cattle, however, they are chiefly used in this country as fodder crops. See matter on green fodders.

Digestibility of Peas, Beans, &c.

Albuminoids.	Carbohydrates.	Fat.	Fibre.
85	80	75	60

The State at present produces sufficient of these leguminous seeds for the ordinary demand as stock feed, but more might be grown and used advantageously.

Bran.

This well-known food, prepared from wheat in the manufacture of flour, is a favourite feed for horses in this State. It is especially palatable and is safe. Wheat bran is quite laxative, and for this reason is especially valuable for idle horses and for colts. With horses doing irregular work, the bowels may be aided by increasing or decreasing the allowance of bran. Because this feed is light and soft it makes a mixture of other feeds more suitable for feeding. Bran is very nutritious; it is higher in protein than either oats or corn, and while it should not form the entire concentrate ration for horses, it is very desirable for use in combination with other feeds. (See remarks on chaff.) It also contains about 4½ per cent. of bone phosphates, hence given as a portion of the food to cows in full milk is a profitable feed. The digestibility of the husk of bran is very small (only 13 per cent.), and this makes it excellent for mixing with "meal" to lighten the mass and ensure perfect digestion.

Digestibility of Bran.

Albuminoids.	Carbohydrates.	Fat.	Fibre.
75	75	80	13

This palatable bulky concentrate is one of the most esteemed feeds for dairy cows, being high in crude protein, rich in phosphoric acid, and having a beneficial laxative effect on the digestive tract. It is especially valuable for cows just before and after calving and for young growing animals. A

suitable ration including bran is given in the matter on chaff. Bran is also fed with silage, the following being a suitable daily ration for a cow in full milk:—

	lb.	
Silage	40	1 : 5·2
Lucerne hay	10	
Bran	8	

Bran is not used to any extent as a feed for fattening pigs owing to its bulky nature.

Wheat bran is a suitable feed for breeding ewes, since it contains ample protein and mineral matter and does not tend to fatten.

Pollard.

Pollard is not used largely as a stock food except for poultry and pigs. Although it furnishes more nutriment than bran, pollard is not a desirable food for horses, because of its heavy character. When fed to horses it should be mixed with bulky feed and given in a relatively small amount, otherwise there will be a tendency to digestive trouble. Mixed with various ground grains, pollard is sometimes fed to dairy cows with advantage, since it adds crude protein and phosphorus to the ration.

Pollard is frequently fed to pigs combined with more carbonaceous feeds, such as maize or barley.

During the last six years New South Wales has exported 496,696 centals of bran and pollard. and has imported only 71,367 centals (from New Zealand and England), of which 71,300 centals were imported last year. We therefore produce more than home requirements of bran and pollard.

Green Fodders.

Lucerne, both as pasturage and as hay and chaff, is extensively used in those parts of the State where it is grown. For a long time its use as a horse-feed was discountenanced by many writers, but American experiments have now proved its value when fed with maize to horses. Clover hay has much the same value as lucerne hay; both are highly nitrogenous feeds and are to be preferred as roughage when the grain used is rich in carbohydrates but weak in protein, such as maize.

As a green feed lucerne is probably the most popular of all crops in this State when procurable. It is used for horses, cattle, sheep, pigs, and poultry. It is usually cut and fed fresh to horses and cattle, and frequently grown as a pasture and used to "top off" fat lambs, also for growing pigs. Cattle and sheep on a lucerne pasture are subject to bloat, and care is necessary when grazing these animals. Poultry-farmers usually have a small patch of growing lucerne which they cut as required as green feed for the fowls.

Green lucerne fed alone makes a very narrow ration, the nutritive ratio being 1:4 or less.

Cows may be fed 30 to 40 lb. of green lucerne daily.

Barley is sometimes grown as a green crop for sheep on wheat and sheep farms, and also in the coastal districts for dairy stock. It is also grown as a rotation crop with wheat, and then fed off with sheep.

Wheat is occasionally grown solely as a green crop, but more frequently the main wheat crop is fed off with sheep as part of the system of wheat farming in this State. Sheep are turned into the crop when the wheat is about 6 inches high, the object being to make the wheat stool better.

Oats are also grown as a green crop, and cut and fed when young and succulent to dairy cows.

Sorghum is a valuable crop for green feed, but owing to the danger from prussic acid poisoning, care must be taken that it is not cut or fed off before it reaches a height of 2 to 3 feet. Care must also be taken in pasturing second growth or stunted sorghum. Cutting the crop and feeding in yards is more generally adopted than grazing, and is the more economical.

Rape, Peas, Tares, and Vetches are grown quite widely as green crops for dairy stock, pigs, and sheep. Green rape is usually fed off with sheep and is well suited for the purpose, sheep eating the stalks as readily as the leaves. Rape should not be pastured until a foot high; if care is then taken not to eat it right out, two or three more growths can be obtained. Vetches and tares are most valuable as green food for working horses in the summer. There are two varieties, spring and winter vetch; for fodder crops the spring variety may be sown with oats and the winter variety with winter rye.

Silage.

The use of silage as food for stock is not as widespread as it should be in this State, but many of the more progressive dairy-farmers on the coast make silage and feed it to the cows during the winter months, and others keep a quantity in reserve for drought periods. Experience has shown that green fodder possessing a high saccharine percentage, like maize, produces the best silage. Sorghum makes good silage, and clover and lucerne make silage of high feeding value. Almost any succulent crop can be put in the silo. In the western parts of the State the natural herbage (trefoil, clover, &c.) is sometimes cut with a mowing machine and placed in pit silos for use in times of drought. This is a practice which could be more largely adopted with advantage.

Milk cows can be made to give a full supply of milk on silage and a small quantity of grain food or other concentrate. There appears to be no particular advantage in "sweet" as compared with "sour" silage. Cattle relish the latter just as much, and, although during the first few days that the cows are fed on silage a slight taste may be noticed in the milk, the quality or production is not altered.

Following are examples of silage rations for dairy cows :—

Daily Ration.	Dry Matter.	Protein.	Carbo-hydrates.	Fat.	Nutritive Ratio.
40 lb. Silage	10·0	·52	5·4	·24	1 : 11·4
40 lb. Silage	10·0	·52	5·4	·24	
5 lb. Copra Cake	4·3	·82	2·12	·5	
	14·3	1·34	7·52	·74	1 : 6·85
40 lb. Silage	10·0	·52	5·4	·24	
10 lb. Lucerne hay	8·9	1·33	3·71	·16	
5 lb. Copra Cake	4·3	·82	2·12	·5	
	23·2	2·57	11·25	·9	1 : 5·1
40 lb. Silage	10·0	·52	5·4	·24	
10 lb. Lucerne Hay	8·9	1·23	3·71	·16	
8 lb. Bran	7·06	·9	3·38	·2	
	25·96	2·65	12·49	·6	1 : 5·2
40 lb. Silage	10·0	·52	5·4	·24	
10 lb. Bran	8·82	1·12	4·22	·26	
	18·82	1·64	9·62	·5	1 : 6·5
40 lb. Silage	10·0	·52	5·4	·24	
15 lb. Lucerne Hay	13·35	1·85	5·57	·24	
	23·35	2·37	10·98	·48	1 : 5
40 lb. Silage	10·0	·52	5·4	·24	
8 lb. Lucerne hay	7·12	·99	2·97	·12	
2 lb. Linseed cake	1·78	·52	·77	·13	
	18·9	2·03	9·14	·49	1 : 5
40 lb. Silage	10·0	·52	5·4	·24	
13 lb. Lucerne hay	11·57	1·6	4·83	·2	
2 lb. Copra cake	1·72	·33	85	·2	
	23·29	2·45	11·08	·64	1 : 5·1

Silage is not considered a suitable roughage for horses. Its use is as a succulent, an appetiser, and tonic, to be fed in limited quantities as a supplement to the regular ration. It is a feed which must be introduced gradually into the ration. The amount should not exceed 10 lb. daily per animal. It is a very dangerous practice to feed mouldy or damaged silage to horses.

Return of Infectious Diseases Reported in October.

The following is the return of outbreaks of the more important infectious diseases reported during the month of October, 1924 :—

Anthrax	1
Contagious pneumonia of swine	Nil.
Pleuro-pneumonia contagiosa	,,
Piroplasmosis (tick fever)	,,
Swine fever	,,

—Max Henry, Chief Veterinary Surgeon.

Plant Quarantine Measures.

SOME OBSERVATIONS ON THEIR ESTABLISHMENT IN AUSTRALIA.

R. J. NOBLE, Ph.D., M.Sc., B.Sc. (Agr.), Principal Assistant Biologist.*

WE are gradually acquiring a more adequate realisation of the fact that plant diseases and insect pests are annually responsible for enormous losses in our crops. In a consideration of plant disease alone, we know that serious inroads on national wealth have been occasioned by periodical epidemics, but we now also realise that many of the so-called common diseases are exacting an enormous toll each year. The situation is being analysed by survey in many countries, although but little has as yet been possible in this direction, under Australian conditions.

Apart from the directly destructive action of plant disease, we have also to consider the enormous costs of preparation and application of the various protective solutions and dusts utilised in attempts to minimise losses from this source.

Without reviewing in detail the situation in this and other countries, it may be said that the most destructive diseases are those which have been introduced from other regions Far less frequent are those instances in which a disease of a native plant or other established host has become transferred to a newly-introduced host plant. Generally, also, such diseases are of relatively slight importance in the country of origin, but they have assumed surprising virulence when transferred to a new environment. The increased virulence is attributed to the fact that in such instances there is established a new biological relationship between host and parasite, in a region where natural selection has not already resulted in the elimination of the susceptible types.

It is also generally agreed that man is the principal offender in the introduction of disease into new areas. At the outset, it might appear that wind distribution should prove an important factor in causing initial infections in new areas, but the volume of evidence—chiefly from careful epidemiological studies—does not support this view. Hence, of the four general methods of plant disease control, viz., exclusion, eradication, protection, and immunisation, the first-mentioned appears to offer the most direct and the most economical means of effectively meeting the situation. Many countries have therefore established a series of plant quarantine measures which aim at preventing the introduction of specific plant diseases into new areas.

* Paper read at the meeting of the Australian Association for the Advancement of Science, held at Adelaide in August, 1924.

The question arises, however, as to how far this method of disease control is a measure of practicability. Some investigators maintain that no series of regulations or restrictive measures will ever be sufficient to prevent world-wide distribution of all crop diseases, and that environmental conditions alone will determine their ultimate distribution. The almost universal failure of local or domestic quarantines seems to supply a good deal of justification for such a view. In these instances, attempts have been made to prevent the spread of an apparently newly-established disease, by the erection of artificial boundaries around a proclaimed area. In almost every instance the disease has gradually spread across the boundaries, and the restrictions finally have had to be lifted because of their inefficacy.

This was the experience with the "powdery scab" disease of potato (*Spongospora subterranea*, Johns.), when it was first found in Canada and Maine, U.S.A. The original quarantine did not prevent wide distribution of the disease, which is now to be found on occasion, wherever the conditions are favourable to its development. It will probably be found that a similar situation holds for this disease under Australian conditions. Another example is afforded by the history of the development of the "brown spot" disease of citrus (*Colletotrichum glœosporioides*, Penz.) in New South Wales. In spite of the original quarantine of an affected county, the disease has since been found practically wherever environmental conditions are favourable for its development. Many similar instances are afforded by the history of local quarantines in other parts of the world.

Local quarantine of an already established disease is of very doubtful value. The restrictive measures are particularly difficult to enforce; they have, perhaps, a slightly salutary effect in causing slight delay in the widespread distribution of disease from the quarantined area, but except in isolated instances, where eradication and the use of resistant types can be incorporated in the control scheme, the failure of this method is almost a foregone conclusion. It is believed, however, that we can have greater confidence in the efficacy of certain foreign quarantine measures. It was mentioned above that man is the chief agent in the introduction of plant disease into new areas. When once established, a new disease is readily spread by natural agencies in a favourable environment, and is checked only by the presence of great natural barriers, *e.g.*, oceans and deserts. Geographical isolation is therefore a great potential safeguard; but with increased transport facilities the international exchange of plant parts constitutes a very grave menace to the plant-wealth of an importing country. Unfortunately, many plant diseases may be carried in a dormant condition, and their presence cannot be determined by inspection alone. A newly-introduced disease may thus escape detection for a considerable period unless special provision is made for inspections during the growing period. For example, some years ago, "peach rosette" was observed on trees in New South Wales: it had developed in apparently healthy wood imported from the United States.

The unrestricted importation and distribution of plant parts for propagative purposes, on the other hand, would ultimately result in the introduction of many new and possibly serious parasites.

It is often stressed that we have practically no information which will indicate whether a disease is likely to be serious or otherwise when introduced into a new area; hence it is argued that a country is justified in prohibiting the entry of any agency likely to introduce new disease. This is the essence of Quarantine 37 of the United States, now in force. With its accompanying exemptions for necessary importations under control, this comprehensive measure confers the maximum degree of safety under the existing circumstances. The regulations caused a good deal of inconvenience and distress in some quarters, but they provide a better type of insurance than was ever previously possible.

The situation in Australia requires special consideration; while the obvious advantage of the ideal of exclusion with all justifiable exceptions must be admitted, many phases require individual examination.

It should, however, be agreed that it is the function of the advisory bodies concerned to safeguard the ultimate welfare of the whole community by such restrictive measures as are calculated to prevent the introduction of new diseases, but, taking cognisance of all the facts available, they do not at the same time impose undue restrictions on ordinary trade requirements. This statement is made in view of the fact that sometimes there is a tendency to use the principle of exclusion on biological grounds as a cloak for an economic protection, which perhaps is not always justified on its own merits. This has particular reference to the introduction of fruit and other products for local consumption; *e.g.*, "fire blight" (*Bacillus amylovorus* (Burrill Trevisan) is not carried over by means of affected fruit, although there would be a very real danger in the importation of certain rosaceous stocks from affected regions. Then, also, quarantine restrictions against the introduction of citrus fruits are justified insofar as they are based on sound biological principles only. If economic protection is necessary in any particular instance it is entirely a separate matter.

Attention has frequently been directed to the need for systematic plant disease surveys, both in the exporting and the importing countries concerned. The surveys are obviously fundamental to any consideration of plant quarantine or restrictive legislation. Of great significance also are those studies in the relationship of parasite and plant under controlled environmental conditions, for we obtain from the results of such investigations more definite information as to the probable development of the relationship in a new natural environment. Careful epidemiological studies on those diseases in the countries in which they have already become established are also of fundamental interest to those countries still exposed to the dangers of their introduction. It may even be of value for an importing country to conduct its own investigations abroad in some instances, as the United States Department of Agriculture has already demonstrated. The results of such investigations may be expected to

provide data to justify close restrictions or on the other hand may tend to allay unnecessary alarm.

It was agreed at the Pan-Pacific Congress last year, and reaffirmed on subsequent occasions, that we are urgently in need of a more uniform and adequate regulatory system for the importation of plants and plant parts, a system which will provide every safeguard, and yet furnish every facility for the improvement of agriculture and the welfare of the community. Specific recommendations concerning personnel and the necessary facilities have already been made, but nothing has as yet been finalised.

It is apparent that undue restrictions have been imposed in some instances in the past, while in other cases excessive freedom of movement has been permitted. For example, shipments of fruit stocks have on occasion been condemned because of the presence of the "crown gall" disease (*Bacterium tumiefaciens,* Sm. and Towns). This disease, however, is already established here, and, although it is agreed, for obvious reasons, that affected stock should not be distributed, yet the rejection of an entire shipment because some plants are affected by the disease, does not appear to be warranted. A recent review of the crown gall situation in America[s] confirms the general experience here that the severity of this disease is closely linked up with local factors.

Then there are instances in which greater freedom might be permitted as soon as new facts justify a modification of existing restrictions. The first measures in connection with fire blight prohibited importation of all plants from an affected area. They were later modified to exclude only those plants of the family *Rosaceæ*. Should new evidence indicate that certain groups of plants in the order have proved to be immune to the disease, the present restrictions might also be modified.

The question has recently been raised whether we are justified in excluding ornamental roses on the grounds that they may introduce fire blight. Circumstantial evidence indicates that roses may be not affected by this disease. The Bureau of Plant Industry, United States Department of Agriculture, has reported that even in pome-fruit orchards severely affected by fire blight, wild roses growing under diseased trees have shown no signs of the disease. On the other hand, we have some incomplete evidence from the Cornell Agricultural Experiment Station that hybrid tea roses have been inoculated under greenhouse conditions with the fire blight bacillus, and that infection has resulted, though the lesions did not appear very typical. Dr. Massey reports* that some years ago he observed what appeared to be fire blight on wild roses out of doors, isolated an organism that appeared like *B. amylovorus* in culture and produced infection, but the necessary tests were not completed to determine whether it was the fire blight organism or not.

In this connection, therefore, if further completed research should indicate that certain roses are not affected by fire blight, we should be ready to permit their introduction under licence for the improvement and development of this phase of horticulture in Australia.

* In a personal communication forwarded to the writer.

Another phase of the fire blight question which requires further investigation is that of the possibility of introducing the organism in honey. At present we are imposing restrictions which require certification to the effect that honey produced in New Zealand has been held in containers for fourteen days prior to export. This restriction is supported by the work of Gossard and Walton,[2] who showed that under certain conditions the fire blight bacillus could live in honey for seventy-two hours, that the viability decreased rapidly, and that the organism probably died out within about 100 hours, but finality was not reached. A very simple series of experiments under controlled temperature conditions with New Zealand honeys, would show just whether our present precautionary measures in this respect are necessary or not. Notwithstanding the above, it is agreed that the closest precautionary measures must be maintained to prevent the introduction of the fire blight disease in certain types of fruit stock or other propagative material.

The introduction of plant seed, on the other hand, is attended with much less risk. Nevertheless we are not availing ourselves of the protection that might be afforded against the introduction of seed-borne diseases. Inoculum, which is carried on the surface of the seed, may be destroyed readily enough, but the treatments at present in use are practically ineffective against those parasitic agencies present inside the seed.

To take a specific case, cotton seed may be infected with the anthracnose fungus (*Glomerella gossypii* (South) Edg.), which causes a serious seedling wilt and boll rot in older cotton-growing regions of the world, but which apparently is not yet established in the cotton regions of Australia. This disease is most frequently introduced by means of the seed. The spores may be borne on the surface of the seed or the fungus may be carried internally as resting mycelium. A recent announcement by Lipscomb and Corley[3] is of particular interest, therefore, in this respect. It has been found that control of seed-borne disease may be effected by heating in vacuo, or in the presence of an inert gas. The treatment does not affect seed fats and proteins, and there is no loss of seed vitality, but internally-borne mycelium is destroyed. Further work is, of course, necessary, but as so many new diseases are known to have been introduced in small experimental lots, this method of providing an additional safeguard should certainly be more widely appreciated and developed.

In conclusion, it is again suggested that the maximum degree of safety is only to be acquired when this country is able to supply her own needs to the fullest extent possible by the production of plants and plant products within her own boundaries. We are most fortunate in that our geographical isolation has hitherto proved a great natural safeguard. Prohibition of importations is a very difficult ideal to attain. We must have new introductions for the benefit of agriculture as a whole, and these should be made under conditions which afford every possible safeguard. In the case of general importations, the restrictions should be such as are consonant with the biological principles involved.

A few aspects of the subject only have been discussed in the foregoing. The question of the establishment of an adequate and satisfactory system of plant quarantine measures is of the utmost importance. There are so many phases and complexities to be considered that one can only stress again the necessity for the establishment of a group of plant specialists who can devote the necessary time and energy toward the formulation of a satisfactory solution for Australian conditions.

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2 Gossard, H. A., and Walton, R. C.—"Dissemination of Fire blight," 1922, Ohio Agr. Expt. Sta. Bull. 357, pp. 85–86.

3 Lipscomb, G. F., and Corley, G. L.—"On the Vitality of Cotton Seed," 1923, *Science*, n.s. Vol. 57, p. 741.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1924:—

Description.	Imports.	Exports.	Description.	Country of Origin.	Imports.	Exports.
Interstate.	Cases.	Cases.	*Oversea.*			
Fresh Fruit ..	459,526	156,941	Fresh Fruits—		Centals.	Centals.
Pineapples ...	......	...	Citrus	... .	950	16,304
Tomatoes ..	193,109	...	Apples ..	....	...	448
	bush.	bush.	Pears	....	...	127
Melons ...	......	500	Pineapples ...	.. ..	...	3,516
	lb.	lb.	Bananas ...	....	462	...
Canned Fruit ..	18,788	1,464	Other	....	162	2,444
			Dried Fruits—			
Dried Fruit—			Apples, Pears,		lb.	lb.
Unspecified ...	15,708	1,512	Peaches, &c..	U.S.A.	196	...
Currants	12,540	308	Apples ...	....	...	1,013
Raisins	12,880	...	Apricots ...	....	...	94
Apricots ..	308	224	Currants ..	....	...	163,112
Apples ..	1,540	...	Prunes ...	France . ..	1,400	2,768
Prunes ..	478	...		U.S.A.	25,787	...
Pears	28	...	Peaches	....	...	128
Sultanas ..	......	...	Raisins—			
Peaches .	1,064	112	Sultanas ...	U.S.A.	5	3,482
			Lexias ...	....	...	14,672
			Other ...	U.S.A.	4,050	575
				China	4	...
			Dates	Mesopotamia ..	7,909	94,520
			Other	United Kingdom	110	1,281
				China	5,398	...
				Turkey	5,086	...
				U.S.A	4,128	...
				France	121	...
			Preserved in liquid—			
			Apricots ...	.. ..	..	76,393
			Peaches ...	....	...	137,868

Equipment and Organisation in the Packing Shed.

OBJECT LESSONS FROM A NEW ENGLAND ORCHARD.

W. H. BROWN, Editor of Publications.

AMID the advance that is being made along the whole line in the production of fruit in this State, that part of the front which represents better packing and marketing is certainly making distinct progress. Growers of each class of fruit necessarily adopt weapons of their own for the advancement of the cause, but the consumer—occupying also the place of spectator—is able in a measure to estimate how much ground has been gained in this respect, the goods displayed for his delectation in shops and on barrows presenting to-day a uniformity and general attractiveness once almost unknown.

The co-operative packing houses that are becoming a feature of importance in relation to citrus are likely to have a definite influence upon the equipment and organisation of private sheds, even where other classes of fruit are handled, but growers may also with profit observe the plants and the methods adopted in various privately-owned sheds in different districts. That of Messrs. Neil and Buchanan, "Pomona" orchard, close to Uralla, deserves attention in this way. No doubt other complete and well conducted equipments in the State could be pointed to, but there are features about this one that are well worth describing. Mr. Neil, the managing partner, is responsible for the shed and its equipment, and he was good enough to point out its features lately.

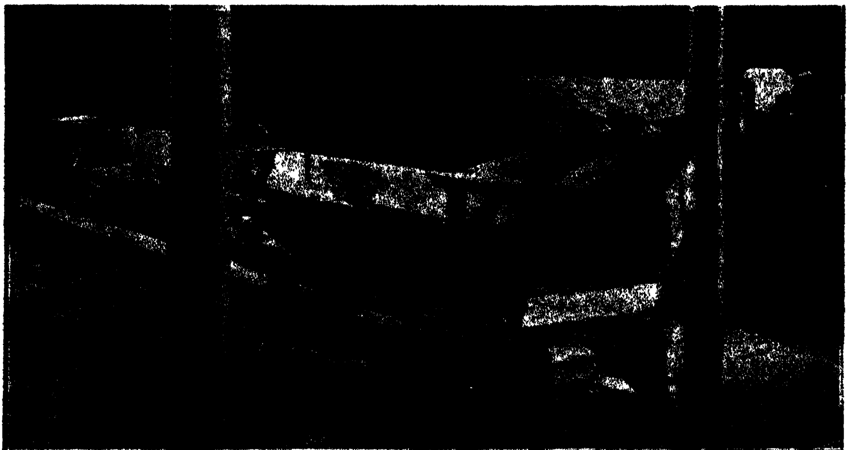
There are some 55 acres under trees, of which about 6 acres are cherries, and almost all the balance apples and pears. The output of apples runs into several thousands of cases annually, so that systematic handling in grading and packing is a consideration. As a matter of fact, the adoption by this grower of one improvement and contrivance after another has reduced the whole routine in the shed to a smooth-working piece of machinery, in which labour costs have been minimised, and the quality and the appearance of the fruit are carefully conserved.

It is some years since a mechanical sizer of well known and generally satisfactory type was installed in this packing-shed, but Mr. Neil was not long in finding that, far from solving every difficulty, it only made the need for tightening up the machinery at certain other points more apparent. We cannot do better perhaps than describe the various operations as they are carried out, beginning with the pome fruit, and afterwards touching briefly on the cherries.

First—The Grading and Packing of Apples.

The fruit is received from the orchard in picking cases, which are placed on a table alongside the sizer. From these cases the grader makes two grades, passing the first-grade fruit at once on to the sizer, and the second-grade back into other cases to be sized up and packed later on. The rejects are also put aside at this stage, but of these and of second-grade fruit the quantity is small, for both orchard methods and spraying programme are most complete, and are carefully directed at the production of clean, sound fruit.

The sizer—power-driven, and giving seven different sizes, but returning the large fruit unsized—originally delivered the fruit into so many canvas bins, from which packing could proceed. It was soon found, however, that the



A Packing Table divided into Sections Radiating from the Mechanical Sizer.

The sizer is situated at the upper end of the table, and the packers' stands, mounted on slides, at the nearer (lower) end. Underneath the bins are shoots for the case lining paper, so that it may be handy if the packers have to do their own lining.

bins filled too fast, and that it was necessary to empty them frequently by tipping the fruit either on to the packing table or into cases, which had to be put aside (each size in a separate stack), and later brought back again to the packing table. All this handling not only involved increased labour, but made unnecessary bruising of the fruit almost inevitable.

A Labour-saving Innovation.

Accordingly Mr. Neil devised a large, slightly sloping table, which is divided into six sections that radiate from the various deliveries of the sizer, running out on widening lines to the front of the table, where the fruit rests against a padded board just at the packer's hands. The width of this table (from where the sizer delivers to where the packer works) is 6 feet. The length at the upper end (against the sizer) is 12 feet, and at the lower end (against the packer) 18 feet 6 inches. The sections into which the table is divided are all 2 feet wide at the top and they open out to varying widths at

the lower end, where four of them are about 3 feet 4 inches wide, and the other two, for the smallest sized fruit, only 22 inches wide.

The thin wooden partitions between the sections are made moveable, so that they may be lifted out and the whole table cleaned, and a half-inch space at the lower end allows any leaves or dust to fall through on to the floor. In one or two other orchards in the State somewhat similar packing tables have been installed, and in one case at least the partitions are moveable, so that the size of a particular bin can be increased at will.

As stated above, Mr. Neil's machine has seven bins, six radiating from the side, and one at the end. All fruits too large to pass through the grading belts are carried along the sizer to the end, into the seventh or end table, where it is sized by hand and packed in the way described below.

Other types of sizers are on the market, it may be remarked, some of them being capable of handling two and three grades of fruit at the same time. Another feature of some of them is the provision of extra apertures, which may be used when desired if a large quantity of fruit of the one size is coming through.

Saving Time and Saving Fruit.

Whatever mechanical devices are adopted, however, the avoidance at every stage of damage to the fruit is essential. At "Pomona" this is kept well in view.

Every provision is made to ensure that the fruit is not damaged. It drops from the sizer on to a thickly padded board, and then rolls on to the table, over which hessian is tightly stretched; rolling slowly down the table, it rests finally against the padded board close to the packer's hands.

Moreover, the table is on hinges so that when flat fruit, like Five Crowns, which do not run freely, is being packed the slope can be increased, and when round fruit that runs freely is in hand the slope can be reduced. A padded rake is kept handy when work is proceeding, with which the packer can draw the fruit forward to him if required.

Before the sizing machine was installed all fruit was hand sized, and quite satisfactorily as to the standard of the work, but with some limitation as to speed, and, moreover, with an appreciable loss of time when the variety was changed, it being found that it took the grader some time to pick up the size again.

When the mechanical sizer was first installed, it was found that two men were kept going serving the machine, filling cases from the canvas bins and stacking them aside, and finally bringing the same cases back to the packers. The introduction of the large table with its sections radiating from the sizer to the packers, and capable of holding a large quantity of fruit at a time, has materially reduced the labour required to keep the packers employed, and now only one man is engaged serving the sizer and on related jobs, and he is not so engaged the whole time. "The actual cost of the whole equipment has been saved over and over again," was Mr. Neil's remark. "It saves a whole lot of time, and it saves fruit, too."

The preliminary impression is thus obtained that here is a shed where labour-saving equipment and organisation has been carefully co-ordinated. That impression will be confirmed as we proceed.

The packers, with their tables moving on slides that run on wooden tracks in the concrete floor just alongside the lower end of the large table, have also everything at hand. The cases are prepared by a shed hand, who brands them with the owner's name and variety, lines all cases with paper, puts a layer of wood wool on the bottom, and then stacks the cases close alongside. The packer, equipped with a suitable stand or table, and with wrapping paper held in a clip (for in this shed all pome fruit is wrapped), works with an ample supply of fruit at his hand, having nothing else to do than to pack. The sizer delivers the smaller fruit in sizes down to one-eighth, but the larger sizes to half and three-quarter only. The packer, however, soon learns to distinguish between $2\frac{1}{2}$ and $2\frac{5}{8}$ stuff though they are in the same bin, and also between $2\frac{3}{4}$ and $2\frac{7}{8}$, and with the object of getting a more even pack and a better looking line of fruit the two sizes are packed separately. The $2\frac{5}{8}$ fruit is branded and sold as $2\frac{1}{2}$, and similarly the $2\frac{7}{8}$ is branded and sold as $2\frac{3}{4}$, but the effect of separating the sizes is better, and the buyer appreciates the difference. It is generally found that the apples come from the sizer in runs of one size, and a man may pack nearly a case of $2\frac{1}{2}$ without striking one of $2\frac{5}{8}$; similarly, he may presently get a run of the larger size with hardly any of the smaller, so that the labour of separating the two sizes is not as great as might be thought.

Having filled his case, the packer pencils on the ends the size and lifts it aside, where it is taken charge of by the "nailer." This man's duty is equally defined. He lifts a case from the rows of filled cases among which it stands on to a nailing press of modern type, which handles the fruit in the most approved manner. The old objection that the case stands on the floor, and the fruit is damaged in the nailing down, does not apply here. The case rests at either end on the press, so that the bottom boards of the case have room to "spring" as the top is nailed on. Similarly, the case is gripped at either end on the top by iron claws that draw the top boards down while they are being nailed on. Thus, both top and bottom boards are free to "spring," and the fruit is saved from much of the damage once common.

When the case is put on the press it is first dumped with a padded top-board, then the wood-wool is added and the paper lining turned in; next the lid boards are put in place, and the iron claws drawn over and pulled down with a treadle; finally the top is nailed down.

Ingenuity Overcomes a Difficulty.

In the past season Mr. Neil adopted the wire strapping of the cases, and his testimony is that he is sorry that he had not done so long before. An actual saving has been effected as a consequence. Previously the practice was to

"cleat" all cases, but it has been found that a man can strap two cases while he is cleating one, and the straps cost only about one penny per case.

Some difficulty was found in strapping at first, owing to the rather awkward change necessary to avoid left hand work in putting on the second strap. It was found that the man could strap the first end quite conveniently, but for the other end the case had either to be strapped with a left-hand operation or to be turned with an awkward action and with the danger that it would not be placed right side up in the stack. To eliminate this difficulty, Mr. Neil again put on his considering cap, and presently conceived the idea of a turn-table. To-day, after being nailed down, the case is placed on a small turn-table, where one end is strapped in the usual way, and then the case is simply

A Modern Nailing Press.

The case rests on the press only at the ends, and the top boards are similarly only gripped at the ends, so that both top and bottom boards can "spring" as the lid is nailed down.

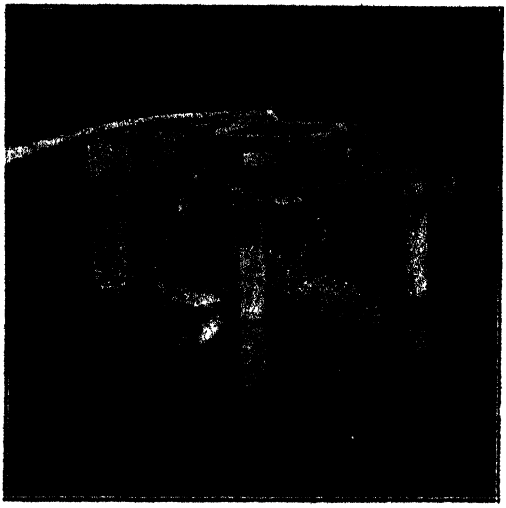
swung round on the table, and, hey presto! it is in position again for the second strap. The man has had no lifting round to do, and he is still working on the right-hand side. He now straps two for one of his previous record.

The whole operation of "dumping," covering in, putting in wood wool, nailing down, removing to the turntable, and strapping with a proper wiring machine is carried out in $1\frac{1}{4}$ to $1\frac{1}{2}$ minutes, and the owner is satisfied to find that nearly fifty cases can be handled per hour for the packer to stack.

Nor is speed the only advantage. Mr. Neil is satisfied that these appointments are all worth their place because they turn out a better "pack."

"Even if a man has only 1,000 cases to market it pays him to put up his stuff properly, and where the product of a large orchard is involved it is essential to a profitable output."

The last operation is to brand the cases with the size of the fruit in the case and the forwarding brand. For this, too, everything is at hand, and it is usual for the nailer, when he has accumulated a stack of twenty or thirty to brand all together. One man by steady going keeps pace with two packers, while another shed hand gives assistance with the stacking of the cases as required. Each season the team seems to become more familiar with their work and faster, and less time is lost at the different stages and changes from one size to another.



An Ingenious Device.

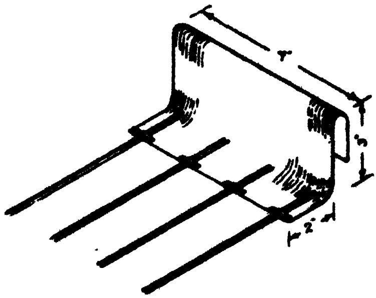
A turntable, devised to enable the case to be wire-strapped at both ends with maximum speed.

In connection with the packing of pears, it should be stated that two varieties (Williams and Packham's Triumph) are hand graded, as the machine will not size fruit of their shape. Winter Nelis and Winter Cole are machine sized.

Another Contrivance.

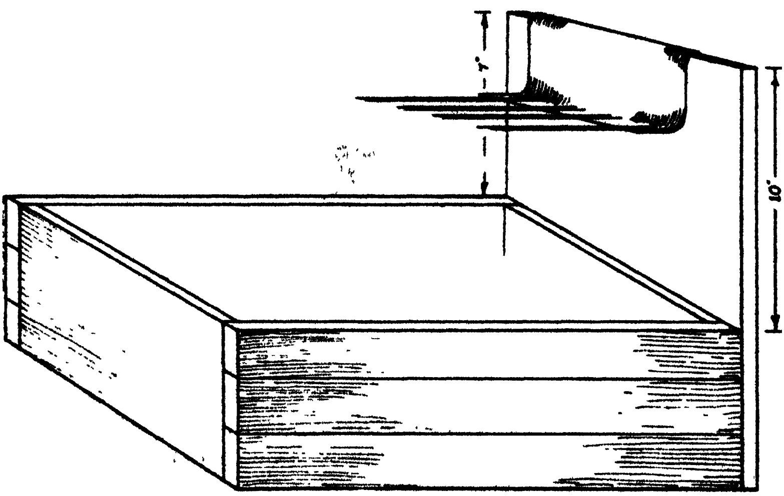
The making of cases is carried on in slack periods and on wet days. Even here anything that facilitates convenience and output is adopted. The characteristic outlook upon labour-saving contrivances is illustrated in the adoption of a small "nail stripper," as it is called. This is a little nail-holder, in which the nails are held by the head between pairs of knitting needles, so that a man engaged in making cases no longer makes hasty dabs into a box of nails to pick up single nails (scratching his fingers as he does so), but has several rows of a dozen to twenty each suspended in a handy position near him, and all with the heads in the same direction.

The little contrivance consists of a piece of galvanised iron, bent so as to fit over a half-inch board, and soldered into it in pairs several knitting-needles. Using an ordinary hundredweight box of nails, Mr. Neil mounted a piece of half-inch wood about 10 to 12 inches high across the box, as a holder for the stripper. His experience indicates that fine needles are most satisfactory, as they pick up the nails quicker. The piece of wood over which the bent galvanised iron fits should not be level, but should slope downwards away from the operator, or he will find that he knocks nails out of the front pair of needles when reaching for the back ones. The stripper is filled by pushing the needle points lightly through the nails as they lie in the box; and with a little practice a large number can be picked up very quickly. In eight seconds 84 nails were picked up by Mr. Neil with this little implement, which requires but little practice to work quite successfully. The box of nails should not be too short, as a certain amount of room is required in which to operate the device.



A "Nail Stripper."

A handy contrivance by which nails are picked out of the case of nails and presented to the operator with heads all one way.



The "Nail Stripper" in Position.

It is best hung over a board nailed to the end of an ordinary nail case. The stripper should be higher at one end than the other.

The Packing of Cherries.

Turning for a few minutes to the packing of cherries, of which Mr. Neil grows and markets a good many hundreds of cases, a few points in his experience are likely to be of interest to other growers. The picking and

carrying in of the fruit is a feature of interest here. Most growers pick from the tree into a can with a handle on it, which has either to stand on the ground or to hang on a hook on the ladder, and in neither of these positions is it really conveniently available.

At "Pomona" a picking can has been made by cutting a petrol or kerosene tin in half, and turning the edge over a thickish piece of wire, a vessel of about 7 inches deep being thus obtained. This vessel is carried by a strap of good width that passes, not round the neck but over the shoulder, being attached by spring hooks to the wire that strengthens the top edge of the cut tin. The obvious advantages of this as a picking tin are that it is always conveniently handy, it does not become a drag on the back of the neck, and it leaves both hands free to pick or to climb the ladder. Both at Young and Orange this method is extensively used, and most pickers of experience seem to prefer to pass the strap over the shoulder rather than round the neck.

A Picking Tin of Convenient Type.
Made from a kerosene tin, shaped to rest comfortably against the body, and finished with shoulder strap.

A number of other cherry growers in the Uralla district also use cut-down tins, but mostly with a fixed handle and hook attached. Where picking is done on piecework it is a great advantage to have the tin cut to the exact capacity of the cherry case. Mr. Neil, on the other hand, prefers to pick on day wage, and the size of the picking can is of no consequence to him.

When the can is full, the strap is lifted over the head or the spring hook is unclasped, and the cherries are emptied carefully into a large wooden tray, on the bottom of which a double sheet of paper has been spread. The tray is made by cutting a kerosene case in half, but lengthways, so that the tray is long and shallow and holds roughly about two cases of fruit. A number of trays having been filled, they are placed on a sort of double-decked stretcher, which takes eight or ten at a time, and the whole thing is carried by two of the men to the packing shed.

The fruit is only tipped once—from the picking can into the tray—and is not tumbled about in a way that is likely to damage it. The large flat trays enable any damaged or inferior fruit to be seen at once and discarded.

In the shed the tray is put on the packing table, and a cherry case—canted towards the operator and with paper lining always in place—is placed alongside. The fruit is lifted out of the tray into the case, and " faced up " diagonally on the bottom. In reality this is the top of the case, for it is the bottom boards that are put on last.

The facing up being finished, the case is put down on the flat and filled, and is then ready to be passed on to the nailer. A padded board is put over the top by this operator, and the case is given a dumping to settle the contents firm, any spaces are filled up, the paper is turned in, and the lid nailed down. Women make good packers of cherries, and face fifty to sixty cases in a day.

As in the case of the apples, the cherry case is branded with the grower's name and the variety on the lid before the fruit is packed, and in this case the consignee's name is put on the end at the same time. Branding before packing ensures that the brand is on the right side; if it is left till after the fruit is packed and the lid nailed down there is a danger of the brand being put on the wrong side.

Organisation in Spraying.

One other illustration may be given of the way in which organisation and good equipment may be made to serve the profits of the orchard. This time it has nothing to do with the packing or marketing of the product, and may even appear a little irrelevant, but there are orchardists—a good many, one may hope—to whom practical suggestions ever appeal.

Pursuing in general the suggestions on spray management made by Messrs. Allen and Brereton in this *Gazette* a year ago, Mr. Neil has adopted the method of carting spraying material to the spray cart in the orchard in order to save the loss of spraying time involved in bringing the whole outfit to the depot for refilling.

The water is carted from the shed or depot to the spray pump in a wooden vat mounted on an ordinary spring cart, and with it goes the spray mixture contained in old milk cans. Some orchardists dilute this spray down to the correct strength in the supply cart, and run it direct from the cart into the spray pump, but that means the vat is spoiled for practically all other purposes, whereas there are times when it is decidedly convenient to be able to use the supply cart for the conveyance of water uncontaminated by spray material. No doubt in the case of certain sprays—particularly Bordeaux mixture—the strength may be slightly affected by the concentrate being put into the cans, but Mr. Neil attaches less importance to that than to the convenience of a clean vat.

The vat is of 110 gallons capacity, and the practice is to make up the concentrated spray mixture so that 100 gallons of water shall be added at the pump to produce the correct strength. The extra 10 gallons is carried in view of the little ways in which a small quantity of clean water is often of use in the orchard during operations.

Originally the spray pump had to be filled from the supply cart by baling, but this tedious method has been cut out by flanging into the bottom of the vat a 2½-inch tap and running the water into the pump through a flexible hose.

When the supply cart reaches the spray pump in the orchard, the driver of the cart takes charge of the tap and of the connecting hose, while one of the spray hands pours the mixture from the one-time milk can into the pump. The agitator is also kept going during this operation, so that a thorough mixture of the spray is obtained. The other spray hand meanwhile oils up the engine and pump and attends to anything else required, so that when the pump is full the plant is ready to start work again at once. The whole period over which the spray pump is stopped is thus reduced to seven or eight minutes. The operation certainly involves the services of a third man to drive the supply cart, but the time lost by the two spray hands where the whole outfit has to be taken to the depot to be refilled is much more serious.

A Hint to Others.

The features of the orchard which we have thus described may well be commended to the consideration of others. Some of the methods adopted are not original, though one or two of them must be quite unique, and might well have many followers, but the Department's intention in drawing attention to them is rather to indicate to growers in how many ways unnecessary operations can be cut out, and with what monetary advantage.

It is the adoption of the same objectives—the maximum of facility and convenience with the minimum of labour—rather than the deliberate adoption of all the details, that can be pursued by others with greatest profit.

Summer School in Apiculture at Hawkesbury Agricultural College.

Arrangements have been completed for the holding of the usual Summer School in apiculture at Hawkesbury Agriculture College. The school will run from 7th to 23rd January, 1925, and will be open to applicants of either sex over sixteen years of age. A fee of £4 4s. (including board and lodging) will be charged for the course. Instruction will be given in all branches of bee-keeping, a series of lectures on different aspects of apiculture supplementing the tuition in practical work.

Prospectus and application forms for admission may be obtained from the Under Secretary and Director, Department of Agriculture, Sydney.

Supplementing Pollen Supply for Bees in Spring.

H. GRAHAM SMITH, Apiarist, Hawkesbury Agricultural College.

THE development of colonies of bees in spring depends mainly upon the supply of pollen with which to feed the larvæ. A lack of this food invariably results in slowly developing colonies and sometimes in malnutrition of the larvæ, and consequently a weak stock of adult bees. Pollen shortage at the season mentioned can, however, be overcome to some extent by planting trees

Juniper virginiana—A Good Pollen-yielding Tree.
The smoke-like clouds are merely pollen disturbed by a handful of pebbles thrown into the tree at the moment the photograph was taken.

that yield this important element of bee-food in abundance. All practical apiarists recognise the foolishness of planting trees from which to gather a surplus of honey, but this does not apply in the same degree to food for the sustenance of colonies. Good pollen-yielding trees may be planted profitably where they will be accessible to bees, but it is not suggested that when such trees have been planted no pollen shortages will occur.

This article deals primarily with the condition in early spring, when colonies act more or less in response to external influences and the food supply available. The most disastrous pollen shortages are those that cause sudden famine at a time when large quantities of brood are requiring to be fed.

In the neighbourhood of the College the pollen supply in August and September is not usually very plentiful. This has led to the close observation of bees' activities on certain trees near the apiary, with the result that two trees have been noted as being particularly valuable pollen-producers. The first, *Juniper virginiana*, is probably the better known. It blooms in August and yields pollen very profusely. When bees alight on the flowers the fanning of their wings is sufficient to dislodge the pollen grains, so extremely fine and light are they, and they rise in the air almost in the form of smoke. The accompanying photograph, which was obtained as a handful of pebbles was thrown into the tree, gives an idea of the quantity of pollen it produces When this condition obtains, bees do not work upon the tree so freely, probably because of the difficulty in collecting; they appear to work this tree best in the early morning before the dew has evaporated.

The other tree referred to is a handsome Mediterranean tree, *Celtus australis*. It is deciduous, has a spreading habit, attains a height of about 30 feet, and blooms for about two weeks late in August before its leaves appear. The manner in which the bees work upon this tree is truly remarkable. While standing some sixty yards away from the tree, the writer's attention was attracted by a jubilant hum, and proceeding in the direction from whence it came, thousands of bees were discovered working feverishly upon it. The pollen is a dirty brown in colour, and is gathered by bees in large quantities.

Both these trees make ideal windbreaks, and would prove valuable sources of pollen in localities lacking in pollen-bearing flora in the spring.

One of the unsolved problems of commercial apiarists at the present time is the periodical pollen famine. The foregoing is not recommended as a solution, but the planting of good pollen-bearing trees is certainly a step in the right direction, however insignificant it may appear.

Oiled Paper for Packing Apples.

The use of oiled paper for packing apples is on the increase among American growers. At least one-third of the commercial crop, or between 12 and 15 million boxes, in the various north-eastern shipping sections were wrapped this eason, it is stated, as compared with about 600,000 boxes last season. The use of oiled paper is said to have had the effect of preventing or much reducing damage by scald in common or cold storage or in transit. So successful has this style of wrapping proved that many packing houses are stamping their boxes with the words "oiled wrap."

"Black Leg" of Cabbage.

W. A. BIRMINGHAM, Assistant Biologist.

THIS destructive disease of cabbage and cauliflower is due to a fungus—*Phoma lingam* (Tode) Desmaz. Brussels sprouts, kohl-rabi, rape, kale, turnips, radish, and various related cultivated and weed plants may also be attacked.

In June, 1924, specimens of cabbage from Earlwood were submitted to the Biological Branch for examination. The stem and roots were attacked by the fungus, and in one bed fully 50 per cent. of the plants were badly affected with the disease. It was ascertained that the seedlings had been procured from a neighbouring grower, and his garden was also visited, and beds found in which not less than 75 per cent. of the plants were badly affected. The owner stated that the disease first made its appearance in the seed-bed, and that a large percentage of the plants were killed. Those remaining were planted out, but later developed the disease in the field.

Fig. 1.—Cabbage "Black Leg." (*Phoma lingam*).

The first grower concerned also obtained a batch of seedlings from another neighbour. This crop was quite free from disease, as also was the crop of the grower from whom he had obtained the plants.

During September of this year a cauliflower leaf showing *Phoma* spots was forwarded for examination by a grower at Kangaroo Valley. He states" . . . . nearly all my cabbages and cauliflowers were a failure this year through it." In a later letter this grower informed us that he had lost 75 per cent. of the cauliflower crop, and 50 per cent. of the cabbages owing to this disease, the remaining plants being more or less affected.

Symptoms of the Disease.

The fungus may invade almost any part of the plant, the worst damage occurring when it attacks the stems of young plants

either in the seed-bed or the field. Infection generally occurs on the stem near the surface of the ground, producing dark sunken areas. The disease spreads into the root-system, killing it and also the base of the stem, resulting in wilting and finally the death of the plant (see Fig. 1).

Spotting of the leaves also occurs, the diseased areas, at first circular in outline, being covered with minute raised black specks. These black points are the spore-cases (pycnidia) in which the spores of the fungus are borne. The

Fig. 2.—Cabbage leaf affected with "Black Leg."

circular spots later run together, forming elongated dead areas, whose spread laterally is checked by the main veins of the leaf. The condition is well illustrated in Fig. 2.

The parasite is harboured in the soil on fragments of diseased stems and leaves, which may persist for two or more years until they have fully decayed. It is common in the field, and where it so occurs the seed may carry the infection. The most serious trouble arises from seed-bed infection, either from the use of infected seed or from using infested soil in making the bed.

Precautions and Controls.

The first precaution lies in securing seed from a crop known to be free from disease and in seed-disinfection. New soil free from cabbage and cauliflower debris should be obtained for the seed-bed if possible. If old or doubtful

soil must be used, it should be steam sterilised where practicable. Another means of sterilisation is to place the soil on a sheet of iron over a fire, though this method has the disadvantage of destroying the humus-content of the soil.

The disease is spread in the seed-bed largely by spattering drops of water; hence care must be taken to avoid unnecessary splashing where artificial watering is resorted to. Irrigating the beds rather than overhead watering is preferable.

For the disinfection of the seed, corrosive sublimate, which can be purchased from the local chemist, is used. It is made up in the proportion of 1 part to 1,000 parts of water, about ½ oz. to 3½ gallons of water. The seed is placed in a piece of coarsely woven material, such as hessian or cheese cloth, allowing sufficient room for thorough agitation. It is then soaked in the corrosive solution for thirty minutes, followed by repeated rinsing in clean water, and then spread out in a thin layer to dry. *Corrosive sublimate is a deadly poison and care must be taken to keep it out of the reach of children and farm animals.*

This treatment does not completely rid the seed of the fungus, but it greatly reduces it.

In the case of bad development of the disease, crop rotation should be practised, and in general, sanitary measures are to be recommended. As far as practicable, diseased material should be burned, and an endeavour made to prevent diseased material from being scattered on clean land. Stock should also be prevented from having access to non-infested land after roaming in infected areas. It is not desirable to use plants from another locality the history of which is not known. Growers should select their own seed from clean vigorous plants of the standard type.

The control measures may be summarised thus :—

1. Select or secure clean seed from a crop known to be free of disease.

2. Where doubtful seed must be used, it should be disinfected with corrosive sublimate.

3. Use clean soil in the seed-bed; if old or doubtful soil is used it should be sterilised.

4. Three applications of corrosive sublimate to the seed-bed at the same strength as that used for seed disinfection has given good control.

5. Irrigating the seed bed is preferable to overhead watering.

6. A rotation of crops should be practised. Cabbages, cauliflowers and allied plants should not be grown on infected land for at least two years.

7. As far as practicable, burn all diseased material.

8. Prevent stock roaming from infested to clean areas.

9. Where affected and clean beds occur in the same garden, cultivate the latter first.

[Photographs by Mr. W. J. Rae.]

Whatever the Branch of Dairying, Milk Records Pay.

Whatever the branch of dairying (points out a publication of the English Ministry of Agriculture), the practice of keeping records of the quantity and quality of the milk yielded by the cows pays.

The system is of value to the milk seller, to the butter-maker and cheese-maker, and to the breeder, according to the object for which the cows are kept. It enables the milk-seller to know exactly what yield his herd of cows is giving, and the quantity and quality of the milk given by each individual animal. He can thus identify cows which consistently give a low yield or produce milk of low quality, and, by disposing of them, prevent the loss due to maintaining cows that are not worth their keep. It must be remembered that some cows give large daily yields for a comparatively short period, while others give moderate daily yields over a long lactation period, and a difference of 100 or even 200 gallons is not easily appreciated when spread over the whole period. When milk sells at 1s. 6d. per gallon a difference of 100 gallons represents £7 10s., and it is probably not too much to say that cows in the same herd frequently differ in their annual production by as much as £15 without their owner being aware of it. When butter or cheese is made, the importance of obtaining milk with a high percentage of fat is obvious, while to the breeder the practice of milk-recording is perhaps even more important, as by this means he can select with certainty his best cows, and bulls descended from his best cows for breeding purposes.

Lice and Ticks in South Australia.

For some years past the Stock Branch of the Department of Agriculture of South Australia has been actively engaged in a campaign against lice and ticks. In that State there is in operation a special Sheep Dipping Act, but it is understood that the authorities regard the action taken by them in preventing the sale of lice-infested sheep and in prosecuting those sheep-owners who expose infected sheep in markets, as having the most marked effect in improving the situation in that State.

During a recent visit paid to Adelaide, the opportunity was taken to discuss with the Chief Veterinary Officer, South Australia, the action taken in that State with regard to these pests.

It is evident that a more active campaign is about to be initiated in South Australia, and the time would be opportune for similar action being taken in this State. Effective control of the disease is more likely if the States are acting in concert.

Now that the shearing season has in many districts been almost completed, and consequently dipping offers no difficulties, Inspectors of Stock in the various districts will be taking more active measures against the pest than has been the case during the winter months.

It cannot be too strongly emphasised that dipping is the only manner by which the flocks of the State will be kept free from lice and ticks.—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

December.

JAMES HADLINGTON Poultry Expert.

Now that the brooder stage of chicken-rearing is over, poultry-farmers will be more at liberty to attend to the hundred and one things that have had to wait a more convenient season. At the same time the farmer cannot even now sit back and regard his crop of young birds as safe. A false move or neglect of details in connection with the growing youngsters might even yet land him in trouble. Catarrh, roup, and chicken-pox, the diseases to which birds in their secondary stage of growth are most susceptible, only await favourable conditions to spring into activity. It is the poultry-farmer's business so to conduct his farm and regulate his flock that the diseases mentioned may have no encouragement.

As mentioned in last month's notes with regard to the earlier stages of rearing, prevention is the only safe course. If only preventive measures are taken in time, roup and wart "cures" can be relegated to the limbo of past ignorance in poultry matters. Again, I would say put your trust not in disinfectants but in prevention of crowding, good hygiene, and last, but not least, the natural resistance of strong birds.

What is Crowding?

The general interpretation of "crowding" is too many units in a given space, but when applied to poultry it has a much wider interpretation, inasmuch as "crowding" or "packing" will take place where there is almost unlimited room to spread out. The fact is that it is a habit with domesticated poultry, and particularly the young, to pack together even on the perches. A poultry house might be sufficiently large to accommodate, say, 300 head, but crowding might be taking place with less than half that number in it, because of the tendency to pack together. Herein lies the main secret of keeping birds healthy.

As regards growing stock, there are only two ways to prevent packing; these are to house in small numbers, preferably 50 to each house, and to place the perches at least 20 inches apart. Open-fronted houses 12 feet x 6 feet are a good size for 50 half- to full-grown birds, such houses to be multiplied by the number of stock to be accommodated. The pullets should remain in these until full-grown.

Early Maturity—Small Eggs.

Most of the winter-hatched light-breed pullets, and some of the heavy breeds also, should be coming on to lay during this month; some will be already laying, but it is not desirable that they should lay too early. The pullets that lay at four and a half to five months old are those that have

matured quickly, which is also undesirable for other reasons. As has been previously pointed out in these notes, maturity and growth are not synonymous terms. It is desirable to have quick growth, which means building up the bird before it becomes productive, while quick maturity, not accompanied by adequate growth, means small birds and small eggs.

Many poultry-farmers are quite alive to the undesirability of producing these small quick-maturing birds, but nevertheless they do produce them. The causes leading up to quick maturity might be stated as (1) faulty breeding (that is to say, breeding from birds of the class referred to perhaps intensified by too close inbreeding), (2) feeding a too-narrow ration during the growing period, and (3) any check to development during the rearing stage due to, say, faulty brooding or any circumstances that retard growth.

If, therefore, we would eliminate, as far as possible, the small eggs that are becoming such a big feature in only too many yards, with the consequent shrinkage of returns, we must eliminate the faults enumerated above, (1) by selecting only well-developed foundation stock strong in the points desired, (2) by feeding a rather wider ration, and (3) by securing the best possible growth in the chicken right from the shell. How to do this last has often been told in these notes. If we would improve the size of eggs we must commence at the egg. Let no one deceive himself on this point. To permanently improve the size of the egg it is not sufficient to introduce a male bird bred from hens laying good eggs. Only a temporary improvement is then possible, unless all the other factors are also attended to.

Keep the Pullets Laying.

The pullets having started to lay, the farmer's next problem is to keep them laying, and the vagaries of pullets in this connection are often most disconcerting. Pullets will often come on to lay quite well, and then, without any apparent cause, will cease. If this were not the case and pullets came on to lay consistently at, say, six months old, the aggregate output of eggs during the summer and autumn months would be almost equal to that of the spring period. The fact that there is a falling off in production during the months January to May inclusive, of about 75 per cent., is not altogether accounted for by the lessened production from older hens. Seeing that this is a regular annual occurrence it is proof that there are fundamental natural barriers to high production during that period, even from pullets that are of an age and condition to lay. While this is so in general, cases are seen each year where a very high rate of production from pullets is obtained, but it is rare to find these performances repeated regularly year after year.

However, making all allowances for seasonal high and low egg-production, without doubt much can be done to improve the general average production over the slack period. In discussing this matter it is not possible to lay down a set formula that will in itself produce better results. Improvement must come from all-round good conditions and environment, together with

a keen sense of appreciation of the little things that go to make up the general welfare of the birds. In this connection it should be realised that feeding, housing, and even the perching of the birds, all play their part in keeping them in condition.

The susceptibility of pullets to change of any kind is remarkable. Once pullets have started to lay, no change of food or quarters should be made during the autumn and winter months. Change from one class of food to another, even though it might be regarded as an improvement (such, for instance, as the introduction of oil cakes, linseed meal, &c., where they have not previously been fed), should be made very gradually, almost imperceptibly. Again, change from wet to dry mash, or *vice versa*, is certain to interfere with the normal laying of pullets.

It is also undesirable to have dry mash before the pullets all day where they are fed with wet mash for the morning meal. This practice is another fallacy that is creeping into the feeding of poultry. While allowing that there are arguments in favour of both wet- and dry-mash systems of feeding, the combination is not a good one owing to the fact that the birds are continually more or less surfeited with food. The saving feature of straight out dry-mash feeding is that it is not sufficiently palatable to entice the birds to eat too much.

Regularity in feeding and attention is almost as important as the class of food itself. The layers should be fed all they will eat without any thought of the old fallacy of getting the birds too fat; at the same time it is equally important that they be kept with a healthy appetite for each meal. Hens that are not keen for their morning mash cannot be expected to lay. The way in which hens come up for their morning meal is the best criterion of the skill or lack of it on the part of the attendant.

Defective Perches.

Only a small proportion of poultry-farmers appear to realize the importance of a proper system of perches. Many are, perhaps, unable to do as they would like to do, but there are many farms where no such obstacles are apparent, and where want of knowledge on the subject is solely responsible for defective systems. It is not generally realized that close perches mean crowding. One sees many poultry houses where the perches are not more than 12 to 15 inches apart. In such houses the birds are packed at night in a mass (head-to-tail and *vice versa*), almost like sardines in a tin. One can imagine what this means on a hot night, especially where the house is not too well ventilated. It should also be remembered that open-fronted houses are not sufficiently ventilated without a good aperture at the back. The results following on this class of perching are sometimes disastrous. Over-heated pullets or hens are not likely to remain in a condition conducive to laying, and a premature moult is often the result. The hot months of

January, February and March are months in which eggs always make high prices. Our motto, therefore, should then be "keep the hen cool."

Again, the losses that result in other directions are considerable. Close roosts are also responsible for a good deal of picking of the cloaca on the perches in the day time, and consequent cases of cannibalism. They are also an incentive to feather picking.

The roosts, too, should be firm. On many farms there are suspended perches, which not only do not serve the purpose for which they are designed, but are most uncomfortable for the birds. Uneasiness on the perch at night when the birds should be at rest cannot be favourable to the best of egg-production.

There is little or nothing to be gained by suspending perches, but where they are so constructed they should be made fairly rigid, so that the birds can be at rest instead of swinging with every movement of a few restless ones.

The idea of suspended perches is, of course, to protect the birds from vermin of the fowl tick and red mite types, but for the most part such perches are constructed in a manner more or less ineffective and troublesome. The advocates of suspended perches claim that such perches prevent vermin from reaching the birds, but they take no account of the birds that roost about on nest boxes or of the necessary visits to the nest boxes for the purposes of laying. Moreover, there are hens that will persist in occupying the nest box or corner of the house instead of the perch. At best the suspended perch is only partially effective and is mostly a delusion. There is nothing better than perches placed on cleats, if both cleats and perches are kept painted with kerosene tar. All these considerations show how necessary is a full understanding of matters that add to the comfort and well-being of the bird.

A Neglected Industry.

The demand for the product, the prices obtained for it, and the disparity between the amount grown locally and the amount consumed, all constitute reasons why the acreage of asparagus in New South Wales should be substantially increased. So far it has been found that the whole of the crop marketed can be disposed of in its fresh state. There are decided possibilities, on the other hand, in the production of asparagus for canning. Practically the whole of the canned asparagus on the Australian market is imported, and the quantity is tending to increase. About 100,000 cases, each containing two dozen tins, are imported annually. The duty amounts to 8s. 6d. per dozen large tins. Reference to the wholesale prices as published certainly suggests canned asparagus as a proposition into which local growers and manufacturers might advantageously inquire.—A. J. Pinn, Special Agricultural Instructor.

Orchard Notes.

December.

W. J. ALLEN and H. BROADFOOT.

HARDENING of the ground, whether from constant use of the spraying outfit or from any other cause, will make it necessary to plough. Ploughing will also be necessary if showery weather has accelerated the growth of weeds to such an extent that the use of the cultivator is ineffective. Conservation of soil moisture is absolutely essential to the promotion of healthy growth and to the productivity of the orchard.

Keep all trees and vines well worked around. Any young trees should be well attended to, kept free from weeds, and treated to a good soil mulch. It is a bad practice to neglect young trees. They should be kept growing unchecked. The neglect of young trees often leads to a stunted tree, and the orchardist cannot afford to have such trees in his orchard.

Pests.

The second cover spray for codlin moth will be applied toward the end of the month. This will make a total of three applications, including the calyx spray. Growers should scarcely need reminding that spraying to be effective must be thoroughly done. A strict watch should be kept for all sources of infection and infestation, such as returned cases, in which much rubbish often arrives on the orchard. This rubbish should be promptly burned, and the cases should be immersed for not less than three minutes in boiling water. This will thoroughly sterilise them and kill any grubs that may be sheltering between the boards.

A strict watch should be kept for slugs, especially on cherry and pear trees, and on their appearance the infested trees should be sprayed with lead arsenate. This pest is easily controlled, but unchecked it will do serious damage. It destroys the leaves of trees and prevents them functioning properly. The work of the leaf is to absorb carbon dioxide from the atmosphere and to change raw food material into organised food material. Injury to the leaf, therefore, means injury to the tree.

Drains.

Surface drains should be kept clear of obstructions. Heavy rain storms frequently occur during summer months, and much damage may result if drains are not kept clear, or if adequate provision has not been made to carry off storm water.

Marketing.

Heavy consignments of stone fruit will soon be coming forward, and growers are advised to take every care in handling and in packing fruit. It should be picked when properly matured but still firm, so that it will not

be damaged in transit, but will be marketed in good condition. Fruit well graded for size and quality invariably commands better prices than badly graded fruit. Rough handling should always be avoided, as when the skin is broken common rot organisms gain entrance into the fruit tissues and cause serious damage. This latter damage almost invariably occurs after the fruit has left the orchard, and often causes serious misunderstandings between growers and agents.

Irrigation.

Where irrigation is practised care should be taken when applying water to see that the subsoil is well soaked and the water confined to the furrows. Water should be applied slowly to allow for good lateral and downward movement of the moisture. As soon as the surface is dry enough the cultivator should be kept going and the soil so worked as to form a good surface mulch. The success of irrigation depends largely upon subsequent cultivation. The area irrigated at any given time should be governed by the facilities for subsequent cultivation. If an area is irrigated larger than can be cultivated in a reasonable time the ground becomes so hard that the value of the irrigation is nullified.

Summer Training.

The summer training of fruit trees is of very great importance, and it should be judiciously and carefully done by those who are fully conversant with the mode of operation. Heavy cutting back in the summer on main limbs, the wood of which has become hard, is not desirable, because such an operation will deprive the tree of too much of its foliage and wood and often results in subsequent stunted growth, but, on the other hand, the pinching back of a strong leader which is growing too vigorously at the expense of other leaders will often convert an ill-balanced tree into one that is symmetrical, and will not only lead to an even distribution of sap but will also obviate the necessity of cutting away much useless wood in winter. Besides this, when trees are making much heavy central growth, the strong laterals may be shortened. This is essential to proper development of the buds, and preserves much good fruiting wood from being robbed by stronger growth.

In young trees also the growths from the buds back to which the branch has been pruned last season, and which will form a continuation of the leaders, can be pinched back. This operation will prevent the limb from out-growing its strength, make it more steady by checking too rapid extension, and render it less affected by strong winds. If the pinching back is done when the limb has grown about 15 inches in length, a number of laterals will develop, which can later be made into leaders if required. It will, too, cause the tree to spread, with limbs originating low down.

Any other strong shoots from the tree may be shortened, but should not be removed altogether. It is a great mistake to take too much from young trees. Some growths may be useless for main limbs or for forming fruiting

wood, but may be very beneficial in protecting permanent limbs during the growing season. Such protecting limbs should only be checked in growth—not removed until the following winter pruning.

Summer training is frequently done in an inefficient, unsystematic, and [illegible]factory way, and the results are of course disappointing. Pinching back should only be done on vigorous trees or on limbs that are flourishing unduly at the expense of others, and only when the wood is soft. [illegible]

Drying Apricots.

Apr[illegible] drying will commence this month. See that the fruit is well coloured and thoroughly ripe before it is picked. The riper the fruit the [illegible]ugar it contains, and the more attractive its appearance. The stones [illegible] been removed, the fruit should be placed on wooden trays with the [illegible] uppermost, removed to the fumigator, and kept away from [illegible] and sun until it has been exposed to the sulphur fumes. The [illegible] time which the fruit should be exposed to the sulphur fumes varies [illegible]e to eight hours, the period being regulated to some extent by the [illegible]d the conditions under which the fruit was grown. It has been [illegible] when the juice has filled the cups the fruit may be removed from [illegible]or, but it should never be exposed to the sulphur fumes for more t[illegible]hours. The riper the fruit the less sulphuring it requires. The q[illegible] sulphur used is 1 lb. to every 300 cubic feet of space.

[illegible] fruit has been subjected to the fumes, it should be placed in the su[illegible]owed to remain until most of the moisture is removed, when the fr[illegible]d to be tough, but not hard.

[illegible]RICULTURAL SOCIETIES' SHOWS.

S[illegible]are invited to forward for insertion in this page dates of their f[illegible]hows; these should reach the Editor, Department of Agri[illegible]ey, not later than the 21st of the month previous to issue. [illegible] dates should be notified at once.

1925.

Society.	Secretary.	Date.
[illegible]. and H. Association	H. R. Hobart	Jan. 9, 10
[illegible]. Society	E. G. Coghlan	" 16, 17
N[illegible]s A. & H. Association (St. Ives)	F. Conway	" 16, 17
Gos[illegible] Association	H. G. Parry	" 23, 24
Kiam[illegible]	G. A. Somerville	" 24, 26
Wollon[illegible]d I. Association	W. J. Cochrane	" 29, 30, 31
Yanco Ir[illegible]A. Society (Leeton)	W. Roseworn	Feb. 10, 11
Moruya A[illegible]ty	H. P. Jeffery	" 10, 11
Central Cum[illegible]H. Association (Castle Hill)	H. A. Best	" 13, 14
Tahmoor and [illegible]H. and I. Society	E. S. Key	" 13, 14
Guyra P. and A[illegible]	P. N. Stevenson	" 17, 18
Pambula A. H. a[illegible]	L. K. Longhurst	" 18, 19
Milton A. and H. [illegible]	F. W. Cork	" 18, 19
Alstonville Agricult[illegible]	W. J. Dunnet	" 18, 19
Tilba A.P. and H. So[illegible]	R. L. Hapgood	" 18, 19
Nimmitabel A. and P. [illegible]	R. K. Draper	" 24, 25

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

Society.	Secretary	Date.
Uralla P. and A. Association	D. T. McLennan	Feb. 24, 2[illegible]
Newcastle A. H. and I. Association	E. J. Dann	„ 24 [illegible]
Blacktown A. Society	J. McMurtrie	„ 27[illegible]
Bega A. P. and H. Society	H. J. B. Grime	Mar. [illegible]
Braidwood P. and A. Association (Jubilee Show)	R. L. Irwin	„ [illegible]
Yass P. and A. Association	E. A. Hickey	„ [illegible]
Tumut A. and P. Association	T. E. Wilkinson	„ [illegible]
Bangalow P. and A. Society	....	[illegible]
Manning River A. and H. Association (Taree)	R. Plummer	[illegible]
Oberon A. H. and P. Association	S. Marsden	[illegible]
Berrima A. H. and I. Society (Moss Vale)	W. Holt	„ [illegible]
Walcha P. and A. Association	A. D. Murchie	„ 10, [illegible]
Mudgee A. P. H. and I. Association	R. Shaw	„ 10, 11, 1[illegible]
Cobargo A. P. and H. Society	T. Kennelly	„ 11, 12
Narrabri P. A. and H. Association	V. W. Jones	„ 11, 1[illegible]
Coraki P. and A. Society	....	„ 11, [illegible]
Hunter River A. and H. Society (West Maitland)	J. S. Hoskins	„ 11, 1[illegible]
Campbelltown A. Society	W. N. Rudd	„ 1[illegible]
Batlow A. Society	C. J. Gregory	„ [illegible]
Cumnock P. A. and H. Association	K. J. Abernethy	„ [illegible]
Bowraville A. Association	L. Waters	„ [illegible]
Nimbin P. and A. Society	....	„ [illegible]
Dungog A. and H. Association	W. H. Green	[illegible]
Crookwell A. P. and H. Society	C. H. Levy	[illegible]
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	„ [illegible]
Rydal A. H. and P. Society	S. Bruce Prior	„ 20, [illegible]
Blayney A. and P. Association	H. R. Woolley	„ 24, 25
Dorrigo and Guy Fawkes A. Association (Dorrigo)	A. C. Newman	„ 24, 25
Cooma P. and A. Association	C. J. Walmsley	„ 25, 26
Goulburn A. P. and H. Society	F. D. Hay	„ 26, 27, 28
Camden A. H. & I. Society	G. V. Sidman	„ 26, 27, 28
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	April 1, 2, 3
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	„ 1, 2, 3
Upper Manning A. and H. Association (Wingham)	D. Stewart	„ 29, 30
Ulmarra P. and A. Society	S. Spring	May 6, 7
Royal Agricultural Society of N.S.W.	G. C. Somerville	„ 6 to 15
Maclean P. and A. Society	....	„ 13, 14
Kyogle P. A. and H. Society	D. Campbell	„ 20, 21
Gloucester A. H. and P. Association	F. S. Chester	„ 22, 23
Richmond River A. H. and P. Society (Casino)	P. M. Swanson	„ 22, 23
Orange A. and P. Association	G. L. Williams	„ 28, 29, 30
Clarence P. and A. Society (Grafton)	L. C. Lawson	„ 29 to May 2
Hawkesbury District A. Association (Windsor)	H. S. Johnston	„ 30 to May 2
Bonalbo P and A. Society	....	June 3, 4
Grenfell P. A. and H. Association	G. Cousins	Sept. 1, 2
Cootamundra A. P. H. and I. Association	W. W. Brunton	„ 1, 2
Young P. and A. Association	T. A. Tester	„ 8, 9, 10
Cowra P. A. and H. Association	E. D. Todhunter	„ 15, 16
Holbrook P. and A. Society	J. S. Stewart	„ 15, 16
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Temora P. A. H. and I. Association	A. D. Ness	„ 22, 23, 24
Canowindra P. A. and H. Association	J. T. Rue	„ 22, 23
Murrumburrah P. A. and I. Association	W. Worner	„ 29, 30
Barellan P. A. and I. Society	H. H. Cuthbert	„ 30
Barmedman A. and H. Society	T. P. Meagher	„ 30
Burrowa P. A. and H. Association	W. Burns	Oct. 6, 7
Narrandera P. and A. Association	W. H. Canton	„ 6, 7
Ardlethan A. Society	R. L. Neill	„ 7
Ariah Park A. Society	J. F. McInnes	„ 14

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